



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

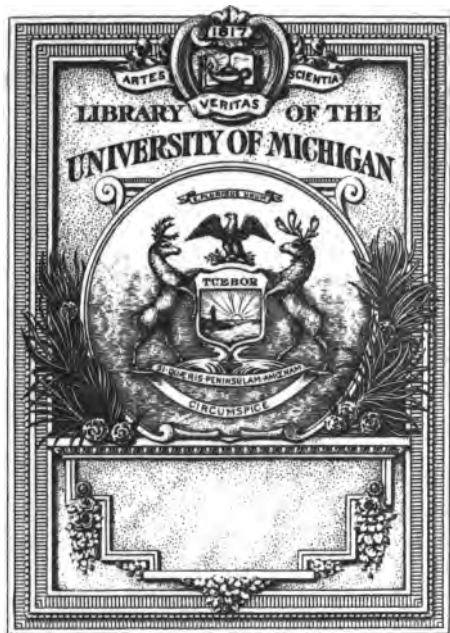
We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

B 444696



HII
9007
N7
A4

STATE OF NEW YORK

REPORT

OF THE

**Department of Farms and
Markets**

INCLUDING REPORTS OF THE

State College of Agriculture at Cornell University

AND

**The New York Agricultural Experiment Station
at Geneva**

FOR THE YEAR 1921

ALBANY

J. B. LYON COMPANY, PRINTERS

1922

Exchange
N.Y. State Library
3/24/31.

STATE OF NEW YORK
DEPARTMENT OF FARMS AND MARKETS

ALBANY, January 16, 1922.

To the Legislature:

In accordance with the provisions of the statutes relating thereto, I have the honor to transmit herewith the Annual Report of the Department of Farms and Markets for the calendar year 1921.

BERNE A. PYRKE,
Commissioner.

REPORT OF DEPARTMENT OF FARMS AND MARKETS

INCLUDING REPORTS OF THE

COMMISSIONER OF FARMS AND MARKETS

DIVISION OF AGRICULTURE

DIVISION OF FOODS AND MARKETS

STATE OF NEW YORK
DEPARTMENT OF FARMS AND MARKETS
Agricultural Hall, Albany, N. Y.

COUNCIL OF FARMS AND MARKETS

	Judicial District	Residence
WILLIAM E. DANA, <i>President</i>	7	Avon
DATUS CLARK, <i>Vice-President</i>	4	Peru
C. FRED BOSHAERT, <i>Member-at-Large</i>		Lowville
MAY B. VAN ARSDALE.....	1	New York City
WM. W. COCKS.....	2	Old Westbury
LEWIS L. MORRELL.....	3	Kinderhook
FRANK W. HOWE.....	5	Syracuse
JOHN G. PEMBLETON.....	6	Owego
WILLIAM F. PRATT.....	8	Batavia
G. HOWARD DAVISON.....	9	Millbrook
EDWIN J. O'MALLEY, <i>Ex-officio</i>		New York City

GEORGE L. FLANDERS, *Counsel*. HERBERT W. LEVERSEE, *Secretary*

DIVISION OF AGRICULTURE

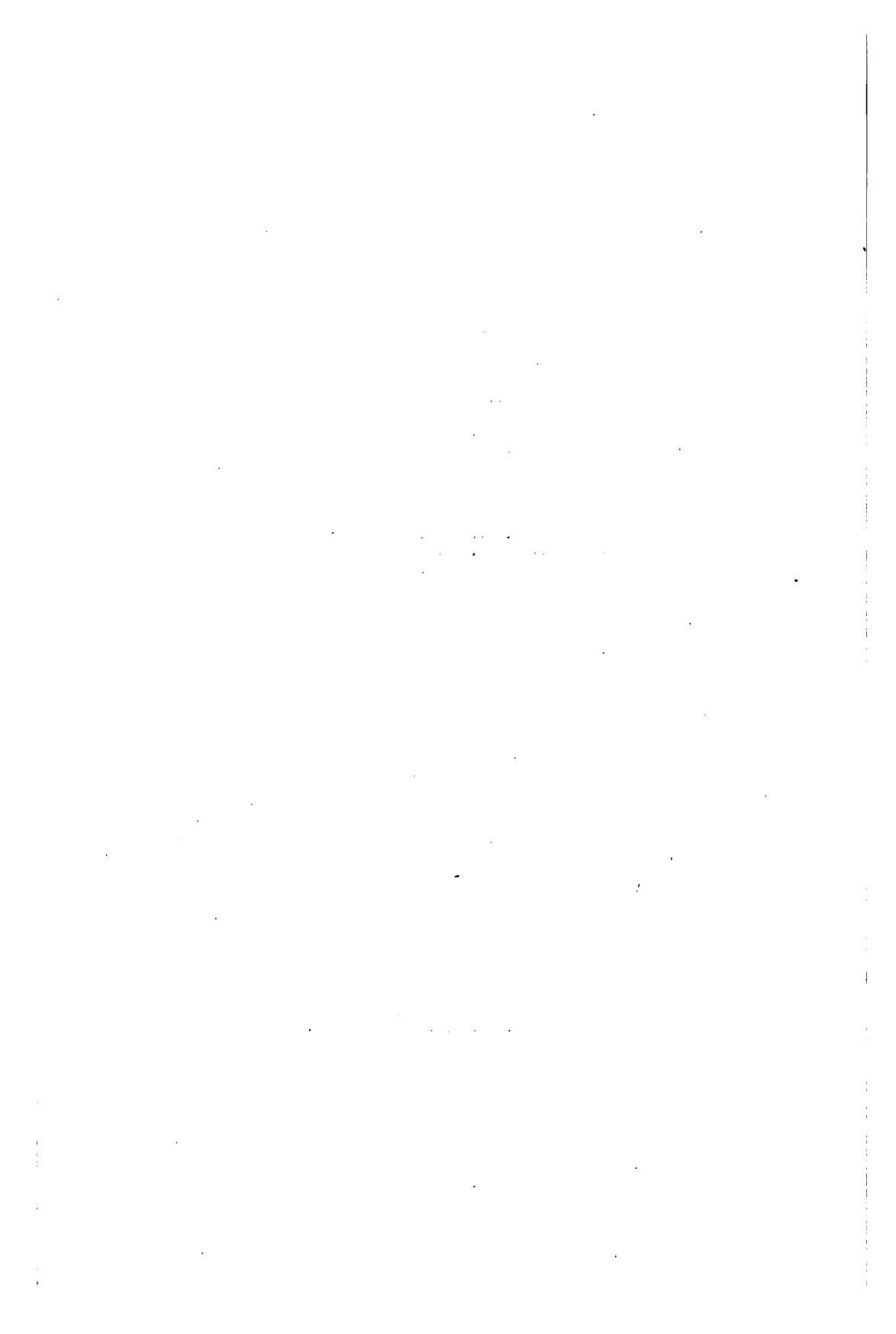
GEORGE E. HOGUE, *Commissioner of Agriculture*
S. C. SHAVER, *Deputy Commissioner*
WALTER S. GREEN, *Secretary*

Bureau of Accounts.....*Director*, E. P. KERWIN
Bureau of Plant Industry.....*Director*, G. G. ATWOOD
Bureau of Animal Industry.....*Director*, D. W. McLAUREY
Bureau of State Institution Farms.....*Director*, C. H. BALDWIN
Bureau of Farm Settlement.....*Director*, F. J. CARR
Bureau of Dairy Products.....*Director*, KENNETH F. FEE
Branch Offices: New York, Utica, Cortland, Rochester and Buffalo.

DIVISION OF FOODS AND MARKETS

DR. EUGENE H. PORTER, *Commissioner of Foods and Markets*
A. E. BROWN, *Deputy Commissioner*
FREDERIC E. FOSTER, *Secretary*

Bureau of Markets and Storage.....*Director*, H. D. PHILLIPS
Bureau of Cooperative Association.....*Director*, CHARLES R. WHITE
Bureau of Food Standardization.....*Director*, DR. E. J. WHEELER
Bureau of Food Products.....*Director*, G. W. V. SPELLACY
Bureau of Licenses.....*Director*, JOSEPH BEAL
Bureau of Weights and Measures.....*Director*, WILLIAM T. WHITE
New York Office, 90 West Broadway.....*Director*, HERSCHEL H. JONES
Buffalo Office, 1046-1048 Ellicott Square.....*Director*, ELISHA FREEMAN



REPORT OF THE DEPARTMENT OF FARMS AND MARKETS

To the Legislature of the State of New York:

The Commissioner of Farms and Markets respectfully submits a report of the department for the calendar year of 1921. During the year 1921 another mile-stone in the history of the agriculture of the State was set by the taking of an important step in the completion of a process inaugurated in 1917 for the consolidation of state activities having to do with the production and distribution of farm and food products. In 1917 the present Department of Farms and Markets was organized, being a consolidation of the Department of Agriculture, the Department of Foods and Markets, and of the office of State Superintendent of Weights and Measures. There was also transferred to the new department certain important activities with relation to foods, formerly carried on by the State Department of Health.

The Department of Agriculture had been organized in 1893 as a successor to the Dairy Commission, which had been formed in 1884. The Department of Foods and Markets had been organized in 1914. Prior to 1914 the only state activity in relation to marketing was conducted by the Bureau of Cooperation of the Department of Agriculture.

The consolidation plan of 1917 provided for a Department of Farms and Markets, consisting of two divisions,—the Division of Foods and Markets under the direction of a commissioner of foods and markets, and the Division of Agriculture under the direction of a commissioner of agriculture. The executive and administrative head of the department was the Council of Farms and Markets, composed of 11 individuals, one representing each of the judicial districts of the State, one the State at large, and the other the Commissioner of Markets of the City of New York *ex officio*. As the result of three years' experience, a feeling developed that for the best results the department should be under the direction of a single head. As an expression of that feeling the Legislature, in 1921, created the office of Commissioner of Farms and Markets as the executive and administrative head of the department.

The delicate responsibility of the appointment of this commissioner was entrusted to the Council, the appointee to hold office at the pleasure of the Council. The position thus created was filled in June, 1921, by the selection of Berne A. Pyrke, of Essex County, as commissioner. Mr. Pyrke, at the time of his selection, was county judge and surrogate of Essex County, and resigned that office to take office as Commissioner of Farms and Markets on July 1, 1921.

The Council, in addition to having the power of appointment of a commissioner, was also continued to assist the commissioner in an advisory capacity. Under the direction of the Commissioner, substantial progress was made during the remainder of the year 1921 in the direction of a complete unification of the department.

CHANGES IN PERSONNEL

A vacancy was created in the directorship of the Bureau of State Institution Farms in June, 1921. This vacancy was filled in July, 1921, by the promotion of Charles H. Baldwin, who had served as an inspector in the bureau for some years. In the same month a vacancy in the directorship of the Bureau of Dairy Products was filled by the appointment of Kenneth F. Fee, of Clinton County.

During the year an important new bureau was created — that of Traffic and Transportation. For a number of years every important industry, other than agriculture, has been served by trained transportation men. The Legislature of 1921, recognizing the deficiency in respect to agriculture, created a new office, that of Traffic Expert. In September, 1921, the position thus created was filled by the appointment of Mr. Norman D. Chapin, who for several years had served with distinction as Traffic Manager of the Syracuse Chamber of Commerce. In the few months that the Traffic Bureau has been functioning under the direction of Mr. Chapin, the wisdom of the Legislature in its creation has been justified. It is believed that the department, through this bureau, is furnishing to the agricultural interests of the State a type of service of inestimable value and a service which will grow in importance from year to year.

Appended hereto are reports of the Division of Agriculture and of the Division of Foods and Markets.

BERNE A. PYRKE,

Commissioner of Farms and Markets.

ALBANY, N. Y., *January 16, 1922.*

DIVISION OF AGRICULTURE

In submitting the report of the Division of Agriculture for the year 1921, attention is called to the work of the Division with regard to the inspection of the milk supply and eradication of bovine tuberculosis, most important from a public health point of view.

The work of the Bureau of Dairy Products, which includes the inspection of milk and enforcement of the law with regard to butter substitutes; and that of the Bureau of Animal Industry, whose chief function is to combat tuberculosis among cattle, is pointed out as most important in this respect. Constant surveillance of the milk supply is necessary if a pure and wholesome product is to be furnished the consuming public. The inspection, through the agents of the Division, has been most thorough, with the result that adulteration of milk has been reduced to a minimum of a little more than one-half of one per cent. The inspection with regard to the sale of butter substitutes has been complete, with the result that where these articles are sold, the purchaser is aware of the nature of the product he is buying.

Bovine tuberculosis which, it is claimed, is transmitted to the human family, especially children, and which has cost the nation millions of dollars in cattle losses, was attacked with increased effort by the Bureau of Animal Industry. Aided by the Federal inspectors and county-employed veterinarians, more than $2\frac{1}{4}$ times as many cattle were examined for this disease during the past year than in any previous year, and the number of cattle condemned was correspondingly large.

It is probably little realized that the Division of Agriculture, through its bureaus, stands as a bulwark of protection against those who would foist adulterated dairy and other milk products on the consumer. It is well, perhaps, to look back a few years to the time when inspection service was not provided by the State.

MILK AND WATER

Complaints of the adulteration of milk and the sale of butter substitutes, and other substitutes for pure dairy products became so general in the eighties that a committee of the Senate was appointed in 1883 to make an investigation. This committee looked, particularly, into the sale of milk in New York City and its report showed that, of 500,000 quarts of milk furnished daily in 1882, 200,000 quarts were either water or skim milk added to the pure milk. In its report the committee stated:

"The evidence adduced before your committee from most careful and intelligent witnesses proved that of 500,000 quarts of milk furnished daily to New York City in 1882, nearly 200,000 quarts

were water or skim milk added to the pure milk in various forms and proportions, entailing the most alarming consequences to the health and lives of young children, and to the comfort and well-being of the whole community.

"We have stated before the fact, so far undisputed, that the ordinary butter of the State, excepting the very best grades, is rapidly disappearing from the market. The witnesses testified that many people have ceased to use butter of any kind by reason of the danger of deception and the constant uncertainty as to the identity of the article purchased and used * * * The adulteration of natural butter by various inter-mixtures of lard oil, tallow oil, benne oil, and other foreign ingredients or coloring matter has been, perhaps, to such an extent, and under such fraudulent cover, that the spurious product found its way into almost every town and city in the State to an amount nearly in quantity to that of the whole production of natural butter sold in our markets."

The report states that at the time of the investigation forty million pounds of substitutes for butter were manufactured for sale in New York.

ADULTERATION REDUCED TO A MINIMUM

Last year, agents of the Division of Agriculture inspected some 100,000 lots of milk, and out of this inspection there developed 665 cases which were referred to the Attorney-General for prosecution. This shows that the milk supply offered to the public today is comparatively free from adulteration as a result of the work of the Division. These figures show that by careful inspection and constant effort on the part of the representatives of the Division, adulteration of milk is a little more than one-half of one per cent. This is a strong contrast to the condition which prevailed in 1882 and 1883, when the adulteration in New York City was about 40 per cent.

It has been stated that civilization has followed the dairy cow.

The effect of a pure and wholesome supply of milk upon the human system has been made so plain by Dr. E. V. McCollum and other authorities that it is unnecessary to go into a discussion of that question. The Department's inspection is directed to the purpose of insuring a milk supply free from adulteration. It has been said that the local authorities might give this, but those who have the welfare of children, and the health of the people at heart seem to feel that without state supervision, the high standards which give New York City and other cities of the State the purest and most wholesome milk supply furnished in any city in the world would be broken down, since it is argued that local influence usually plays a large part in local regulation. With inspection by state agents, it is pretty well understood by those who handle milk, that the standards must be complied with, or a penalty will be collected. Some years ago, the Department brought

actions which resulted in penalties from one dealer totaling \$16,400.

As in all work of this nature, it is probable that it is not well understood, generally. Agents of the Division are sent out by the Bureau of Dairy Products to take samples of milk which are tested to determine whether the product is pure and wholesome and up to the standards provided by the State. At no time are there more than a dozen agents on this particular work, but during the year 1921 an exceptionally large number of samples were taken and adulteration was apprehended before it had continued for any length of time.

ACCURATE TESTS

Another important feature of the Division work is the enforcement of the law providing for accurate tests of milk or cream by the Babcock method, where milk is sold on the butter-fat basis. This affords protection to the producer and is highly valued by him.

TUBERCULOSIS WORK

The tuberculosis work in the Bureau of Animal Industry is based on the proposition that cows unfit to produce wholesome milk should be eliminated. The promotion of the accredited herd plan of tuberculosis eradication is carried on in cooperation with the Federal Bureau of Animal Industry, and includes the supervision of herds which have been accredited as tubercular-free, and which must be zealously guarded against re-infection, and the establishment of areas which are to be free from bovine tuberculosis.

INTERFERENCE COSTLY

That there must be no tampering with the tuberculosis work of the Department, and that tuberculosis in cattle is one of the serious problems before the State, is plain to those who have taken the trouble to investigate carefully. Both from the viewpoint of public health and economy, there is urgent necessity that the State not only continue its policy with regard to tuberculosis eradication, but that it increase its facilities along this line.

TRANSMITTAL TO HUMAN FAMILY

That the bovine type of tuberculosis may be transmitted to the human family, especially to children, is now generally conceded.

Louis A. Klein, V.M.D., in his "Principles and Practice of Milk Hygiene," calls attention to the conclusions of the British Commission, published in 1911, after an inquiry extending over ten years, which follows:

"There can be no doubt that a considerable proportion of the tuberculosis affecting children is of bovine origin, and more particularly that which affects primarily the abdominal organs and cervical glands and, further, there can be no doubt that primary abdominal tuberculosis, as well as tuberculosis of the cervical

glands, is common, due to ingestion of tuberculosis infective material."

Dr. Henry Boswell, Superintendent of the Mississippi Tuberculosis Sanitarium, is quoted as saying that 58 per cent of all abdominal tuberculosis, and 61 per cent of tuberculosis of the cervical gland is due to bovine type of the bacillus, and that 60 per cent of all other forms of tuberculosis in children, exclusive of pulmonary, is contracted from milk from tuberculous cows, and it is his personal observation that all bone tuberculosis is caused by the bovine type. These statements are based on 940 cases of tuberculosis in children.

Dr. H. S. Hatch, of the Sunnyside Sanatorium, Indianapolis, Indiana, points out that since we now believe that practically all adult tuberculosis is due to infection acquired in childhood, and since one-third of infections of childhood are due to the bovine bacillus, it is reasonable to assume that perhaps the bovine bacillus, by long residence in the human host, undergoes a transmutation of type to the human form. If this be so, then tuberculosis of a bovine type is much more prevalent than estimated thus far.

The foregoing shows the results which may accrue from the use of milk from tuberculous cows. It would seem to be clearly apparent that the health of this, and the coming generation, demands rigid sanitary control of the milk supply.

The accomplishments of the Bureau of Animal Industry, with respect to the eradication of tuberculosis, is taken up more completely in the following pages of the report of this Bureau.

The results attained by the Bureau of Dairy Products providing for pure milk supply, and the protection of farmers in the purchase of feeds, fertilizers, and seeds are taken up in the report of that Bureau. In view of the vital importance of the functions of the Division with regard to the milk supply, it has been deemed fitting to explain them briefly in this introduction.

Under the direction of the Commissioner of Farms and Markets, the enforcement of the provisions of the law pertaining to agriculture are assigned to the various Bureaus in the Division of Agriculture. The bureaus of the Division are as follows:

- Bureau of Dairy Products.
- Bureau of Animal Industry.
- Bureau of Plant Industry.
- Bureau of Farm Settlement.
- Bureau of Statistics.
- Bureau of State Institution Farms.
- Bureau of Accounts.
- Legal Bureau.

The work of enforcement is performed from the main office of the Division, in Albany, and through branch offices in New York City, Buffalo, Rochester, Utica and Cortland.

Reports from the bureaus and branch offices, which follow, show their activities in 1921.

BUREAU OF DAIRY PRODUCTS

The principal functions of the Bureau of Dairy Products are: Protection of the consuming public against adulterated or unclean milk and milk products; protection against the unlawful use of oleomargarine and other butter substitutes; and protection for farmers in the purchase of feeds, fertilizers and seeds. In this work, the bureau, through its representatives, has under surveillance all plants and places in the state where milk is received. This Bureau also enforces the law providing for accurate tests of milk or cream by the Babcock method in order that producers may be protected in the sale of their milk, where this method is used as a basis of payment.

DAIRY PRODUCTS

IMPORTANCE OF DAIRY INDUSTRY

The value of dairy products in New York State is greater than in any other state in the Union. According to figures obtained from the United States Department of Agriculture, 48.52% of all the powdered milk, powdered cream, and powdered skim milk produced in the United States during 1920 was produced in New York State. New York also produced approximately one-fourth of the condensed and evaporated milk of all kinds, and approximately one-fourth of the cheese.

New York State ranks first in the production of market milk and powdered milk, and second in evaporated and condensed milk and cheese.

5,000,000,000 POUNDS OF MILK

When it is known that over five billion pounds of milk were produced in this state in 1920, the size of the task of inspecting milk and its products to prevent their adulteration is realized. New York City alone consumes five million pounds of milk per day, a quarter of a million persons being engaged in its production and handling. The improvement of roads and transportation facilities, and the tendency everywhere manifest today to do away with the small cross-roads cheese factory and handle the milk in large centrally located plants, has made the problem of fixing the responsibility for the adulteration of milk more difficult. In the majority of cases the milk is not now delivered to the milk plant by the producer himself, but has been handled by the person in charge of the conveyance, and has been under his supervision during the time en route. Where adulterated milk is delivered by the producer himself, it is obvious that he is responsible for its adulteration. In cases where adulterated milk is delivered by someone other than the producer, it is necessary to ascertain whether the milk was adulterated while in the possession of the producer or at some time subsequent thereto.

SAMPLES COLLECTED

Agents of the Department of Farms and Markets, under the direction of the Dairy Bureau, have collected official samples for analysis during the year as follows:

Milk	899
Cream	121
Sour cream	86
Condensed and evaporated milk	80
Oleomargarine	78
Cheese	13
Milk and cream	12
Butter	9
"Nu Krem"	7
"Filled Milk"	6
Evaporated cream	2

INSPECTION OF MILK PLANTS

Department agents have visited 1,271 factories or establishments in the state where milk and cream were bought and sold to determine their sanitary condition. Where this has not been found satisfactory, the person or firm responsible has been notified to remedy the unsanitary conditions on the ground that it might result in the delivery of unhealthful products to the consumer.

BABCOCK TESTS

Investigations have been made to determine whether the provisions of the statute regarding the making and signing of lists of producers' names or numbers and the results of their tests as shown by the Babcock method, have been observed, where the milk is paid for on the butter-fat basis. In 479 instances agents have retested part or all of the samples of milk used as a basis of payment, and held to permit such retest, as required by the statute, for the purpose of determining the accuracy of the work of the licensed tester. Instruction has been given to testers as to the proper method to be used in caring for and testing samples by the Babcock method. Where any material difference in the results obtained by the licensee and that obtained by our agent has been detected, immediate steps have been taken to remedy the situation, the statute providing that licenses may be revoked on evidence of dishonesty, incompetency, or inaccuracy.

Agents have inspected many thousand lots of milk being received at milk plants from the producer to determine whether this milk had been adulterated. Where tests made with the lactometer have indicated any unusual conditions, official samples have been taken and sent to the chemist for analysis.

LICENSES FOR TESTING

The use of the Babcock test to determine the percentage of butter fat in milk and cream in order that the settlement might be made upon that basis, has been quite generally adopted. For the purpose of insuring as accurate a test as possible, the statute provides that persons desirous of testing milk and cream by the Babcock method, where the result of such test is to be used as a basis of payment, public record, or official inspection, must first secure a license from the Commissioner of Agriculture to do such testing. Licenses are granted only after the candidate has successfully passed an examination and given evidence of good moral character.

EXAMINATIONS HELD

During the year 122 examinations have been conducted in various parts of the state for this purpose, and 546 candidates have passed such examinations. In addition to this 2,007 Babcock testers' licenses have been renewed.

IN CHARGE OF PLANT

Under the provisions of Section 45 of Article III of the Agricultural Law, 1,027 persons have been granted licenses permitting them to act as persons in charge of plants or establishments where milk is received from the producer and sold or shipped in fluid form for human consumption. These persons are required to submit an affidavit with their applications for licenses, stating that they will not adulterate or permit to be adulterated any milk or milk products during the term for which license is issued.

PASTEURIZING SKIM MILK AND WHEY

It is the opinion of many authorities that bovine tuberculosis is spread by feeding domestic animals unpasteurized skim milk and whey from butter and cheese factories. As the state is spending millions of dollars in an attempt to eradicate this disease, the statute was amended, effective September 1, 1920, requiring that whey and skim milk be heated to a temperature of

150° F. before it was sold, delivered, or returned to persons who might thereafter use it for feeding domestic animals. A large amount of work has been necessary on the part of the Dairy Bureau to secure the enforcement of this provision.

City milk dealers who have had reason to believe that their milk containers were being used illegally by other milk distributors have in numerous instances requested that investigation be made as provided for under sections 36 and 36-a. In compliance with these requests inspectors have secured against the vendors evidence which has been submitted to the Legal Bureau.

CHEESE BRANDS ISSUED

Provision is made in the Agricultural Law for providing cheese factories with stencils to be used in marking the cheese they manufacture, and regulating the use of these stencils. During the year 375 of these brands or stencils were furnished in accordance with this provision.

RESTAURANTS VISITED

A large amount of work has been done by the agents of the department in the inspection of restaurants and lunch rooms to determine whether the provisions of the statute in regard to oleomargarine were being complied with, and to sample milk, cream, and milk and cream to determine whether these articles were up to the standard. Scores of violations have been discovered, and evidence of these violations has been submitted to the Legal Bureau for such action as the facts may warrant.

DAIRY STATISTICS

Statistics showing the production and disposition of milk and milk products, the number of milk stations and manufacturing plants, the number of dairies and the number of milch cows in the state, have been collected and compiled.

The Dairy Bureau has tested 779 samples of milk submitted by state institutions, and has reported the results to the State Hospital Commission, the Fiscal Supervisor of State Charities, and the State Prison Department. Where request has been made, results of tests have been sent to the superintendent in charge of the institution from which the sample was received.

CONCENTRATED COMMERCIAL FEEDING STUFFS

The use of concentrated commercial feeding stuffs has increased so rapidly and become so general that there is need for efficient enforcement of the statute relative thereto. Article VII of the Agricultural Law provides for the payment of a license fee of \$25 for each brand of concentrated commercial feeding stuffs offered for sale in the state; and further provides that each package of concentrated commercial feeding stuffs must be marked or tagged with the same brand name, guaranteed analysis, and ingredients as given upon the application for license. The statute gives a list of materials considered to be concentrated commercial feeding stuffs and those considered as roughages, and also prohibits the use of certain materials in concentrated commercial feeding stuffs. It is necessary to check carefully the applications received, and a large number are returned for correction, in view of the fact that many companies seem to be desirous of naming their products in a manner which might deceive the purchaser.

The statute requires the Commissioner, or his duly authorized agents, to collect at least one sample of all concentrated commercial feeding stuffs licensed each year, which samples are sent to the New York State Agricultural Experiment Station at Geneva to be analyzed. Agents charged with the collection of samples are furnished with lists of licensed brands, and these lists are revised from time to time. As soon as reports from the agents are received at this office, showing the brands from which samples have been

collected, all other agents engaged in collecting samples are notified that no further samples of these brands need be taken. If, however, there is reason to believe that any brand is not what it is represented to be, as many samples as possible are secured.

Reports of results of analyses are forwarded by the Experiment Station to the Dairy Bureau. Where these show a deficiency from guaranteed analysis, or a difference in ingredients, it is a violation of the statute. Other practices which violate the statute are failure to license, misbranding, using materials prohibited, and attaching tags to packages with sharp pointed metal fasteners. Sharp pointed metal fasteners are prohibited because they have been known to become detached from the bags and swallowed by the cattle with the feed, resulting in the death of the animal.

FEED BELOW STATED ANALYSIS

In order that the importance of feed inspection work may be recognized, one instance is cited as an example. The U. S. Feed Company of Milwaukee, Wis., licensed three brands of concentrated commercial feeding stuffs for 1921. Agents collected six samples of one of these brands in four counties. The guaranteed analysis upon the application for license and on the packages of feed, and the average result of analysis of the six samples were as follows:

	Guaranteed	Found
Minimum % protein	14.	6.3
Minimum % fat	3.	2.05
Maximum % fiber	15.	21.7

Three samples of the second of the three brands were collected in three counties, with the following average results:

	Guaranteed	Found
Minimum % protein	20.	9.6
Minimum % fat	5.	2.6
Maximum % fiber	14.	21.9

One sample of the third brand was collected, with analysis showing the following results:

	Guaranteed	Found
Minimum % protein	10.	7.2
Minimum % fat	3.	2.1
Maximum % fiber	14.	21.7

The following table gives the number of licenses issued for the year 1921, the number of samples taken, etc. For the sake of comparison, corresponding figures for 1920 are given.

	1921	1920
Number of feeding stuffs samples collected.....	2,197	1,372
Number of feeding stuffs samples on which evidence has been referred to the Legal Bureau.....	696	258
Number of feeding stuffs certificates issued.....	1,566	1,254
Amount paid in license fees.....	\$39,150	\$31,350

The large increase in the number of licenses issued was partly due to the fact that the law was amended, effective January 1, 1921, to include licenses on the sale of bran and middlings, which materials were not required to be licensed prior to that time. In addition to the ordinary increase in clerical work, incident to greater volume of license and inspection work shown in the foregoing table, the increase has been augmented by an effort on the part of the Bureau more promptly to advise dealers and manufacturers of irregularities.

COMMERCIAL FERTILIZERS

The provisions of the statute relative to commercial fertilizer are similar to those mentioned above in the case of concentrated commercial feeding stuffs; the principal differences being that the license fee is but \$20 for each brand and it is not necessary to state the ingredients contained in the material either upon the application for license or upon the package. It has been the policy of the Bureau to refuse to license any material not having fertilizer value, and this has resulted in a material saving to farmers of the state.

Provisions for sampling each brand of commercial fertilizer licensed are the same as in the case of concentrated commercial feeding stuffs. The importance of this work may be seen in the results of analyses of several samples of fertilizer licensed and sold in this state during 1921. A number of brands of fertilizer distributed by a fertilizer company of Baltimore, Md., were taken and several of these samples, taken in various counties, were found upon analysis to be deficient from the guarantee. The company was notified of this fact and forwarded its check for \$350 to cover the penalties incurred.

Agents also collect samples of commercial fertilizer sold to be used on farms of the various state institutions. These samples are analyzed at Geneva, and as a result the state has been saved a large amount of money, as the contracts between the state and the companies supplying the fertilizer provides for reimbursement in case of deficiencies.

FERTILIZER LICENSES

The following table shows the licenses issued for commercial fertilizer, and the number of samples collected in 1921 and 1920:

	1921	1920
Number of fertilizer samples collected.....	950	781
Number of fertilizer samples on which evidence has been referred to the Legal Bureau.....	112	71
Number of fertilizer certificates issued.....	1,167	1,167
Amount paid in license fees.....	\$23,340	\$23,340

AGRICULTURAL SEEDS

The provisions of the statute relative to the labeling and sale of agricultural seeds were amended by the legislature, effective July 1, 1920, in order more fully to protect the purchaser. These provisions are of the highest importance. The effect upon the farmer who purchases a poor quality seed may be threefold. He will purchase seed, a certain percentage of which is useless; this may result in a poor stand and a crop failure; or he may sow his fields to one or more forms of noxious weeds which he can eliminate only with difficulty, if he is able to eliminate them at all.

LABELS ON PACKAGES

The statute requires that each package of agricultural seed be labeled with the following:

- (a) Name of seed.
- (b) Percentage of purity.
- (c) Percentage of weed seeds.
- (d) Name of each kind of noxious weed seeds present.
- (e) Percentage of germination and date of test.

These requirements are varied slightly for different seeds or mixtures. Provisions are made for the collection of samples and their submission to the Geneva Experiment Station for examination. Agents of the Dairy Bureau collected samples of 394 lots of seed during the year, and in 65 instances evidence of violation was referred to the Legal Bureau for such action as the facts might warrant.

TURPENTINE AND LINSEED OIL

The Dairy Bureau is charged with the enforcement of Article 10 of the Agricultural Law, which refers to the sale of turpentine and oil. Agents have visited stores where these products are sold and have collected 48 samples, which have been analyzed to determine the purity of the product, and the evidence secured has been forwarded to the Legal Bureau.

FEES AND PENALTIES

As has already been indicated, \$39,150 has been paid to the State Treasurer for licensing concentrated commercial feeding stuffs, and \$23,340 for licensing commercial fertilizer, making a total of \$62,490. In addition to this sum \$29,896.15 has been paid in penalties, incurred by the violation of the Agricultural Law, on which evidence has been furnished by the Dairy Bureau, making a total revenue of \$92,386.15.

NOTE: The figures given above for Dairy Products are for the fiscal year, July 1, 1920, to June 30, 1921; the figures for concentrated commercial feeding stuffs, commercial fertilizer, and seeds are for the calendar year 1921. The figures showing the penalties collected are for the fiscal year ending June 30, 1921.

BUREAU OF PLANT INDUSTRY

NURSERY INSPECTION

No new conditions arose in this branch of our inspection during the year. Nursery stock is in less supply than for several years, but large importations of seedlings during the winter indicate that the short market will soon be fully supplied.

Five hundred and fifty original nursery certificates were issued and 1,275 duplicates for filing in other states indicates our effort to broaden the sale of New York grown nursery stock.

SHIPMENT INSPECTIONS

This branch of our service is directed to the inspection of nursery trees and plants arriving for use by nurserymen in their trade and by planters throughout the state. The work also involves the examination of foreign importations of such seedlings as nurserymen plant to increase their stock.

As deleterious diseases and insects frequently appear, this line of work is deemed so useful that our methods have been adopted by several other states.

ORCHARD INSPECTION

This work has not demanded as much attention recently as when San Jose scale was deemed to be paramount. This scale has yielded to modern spraying methods and its importance has become negligible in commercial orchards.

A large number of applications have been answered and special advice given to those who contemplated planting of fruits, and to those who desired information on orchard management. Particular attention has been given in cases when diseases like black-knot and peach yellows have appeared.

EUROPEAN CORN BORER

Cooperation with the Federal Government in enforcing quarantines to prevent the distribution of corn from two infested districts of the state was carried out with less friction than usual, for the reason that the borers have spread to such an extent that the quarantine borders, being extended, embrace the cities where usual markets exist for green corn.

The spread of the pest arose from natural flight of the female moths in all directions from centers of infestation, and not largely by commercial shipments.

The areas under quarantine are indicated below:

Eastern Section

Albany, Amsterdam, Ballston, Benson, Berne, Bethlehem, Bleecker, Broadalbin, Brunswick, Cambridge, Caroga, Charleston, Charlton, Clifton Park, Cobleskill, Cohoes, Colonie, Corinth, Day, Duanesburg, East Greenbush, Easton, Edinburg, Ephratah, Esperance, Florida, Fort Edward, Galway, Glen, Glenville, Greenfield, Greenwich, Guilderland, Hadley, Half Moon, Hoosick, Hope, Jackson, Johnstown, Knox, Lake Pleasant, Luzerne, Malta, Mayfield, Middleburg, Milton, Mohawk, New Scotland, Niskayuna, Northampton, North Greenbush, Northumberland, Palatine, Perth, Pittstown, Poestenkill, Princetown, Providence, Rensselaerville, Root, Rotterdam, Saratoga, Saratoga Springs, Schaghticoke, Schenectady, Schoharie, Stillwater, Troy, Wells, Westerlo, White Creek, Wilton, Wright.

Western Section

Amherst, Arkwright, Ashford, Aurora, Boston, Brant, Buffalo, Charlotte, Chautauqua, Cheektowaga, Cherry Creek, Clarence, Collins, Concord, Dayton, Dunkirk, East Hamburg, East Otto, Eden, Ellery, Ellicott, Elma, Evans, Gerry, Grand Island, Hamburg, Hanover, Leon, Marilla, Mina, Newstead, Niagara, North Collins, Otto, Perryburg, Persia, Pomfret, Portland, Ripley, Sheridan, Sherman, Stockton, Tonawanda, Villenova, Westfield, West Seneca, Wheatfield.

GIPSY MOTH

This insect since its appearance in Massachusetts fifty odd years ago has gradually spread from the original center of infestation in all land directions, approximately 125 miles. Townships in New England bordering on New York have recently been found infested by the gipsy moth. This spread has been caused almost wholly by the natural flight of the adult female moths in defiance of expenditures for control measures costing nearly twenty millions of dollars.

Commercial shipments of quarry products, posts, household goods, and nursery stock have been many times intercepted by our inspection service. Notwithstanding special perpetual care, the gipsy moth appeared in various places in the last 15 years, usually in remote sections and in ways not always explained. Three years' attention eradicated the pest from Westchester County, where the worst infestation ever appeared. Nothing has been found there for five years.

The small lodgment in Ontario County was likewise wholly cleared up years ago.

The present situation in regard to gipsy moth follows:

In Schenectady County a lot of posts were brought in and set along the line of the railroad for a distance of about eight miles. These were found infested but have been thoroughly cleaned. Spraying by placing a power pump on a flat car in 1921 will be followed in 1922 by repeated spraying until no caterpillars can be found. Scouting this winter revealed no egg clusters.

In 1921, between Garrison and Cold Spring, gipsy moths were found on spruces carted in from New Jersey. The trees on 75 acres were sprayed and several thousand were banded. No live insects have appeared but it is deemed best to spray as a clean-up measure in June, 1922.

In 1921 a few gipsy eggs were found at Greenport, Long Island. They are lightly scattered over the village a mile in each direction. No damage was ever caused. This colony probably was started by eggs laid on oyster kegs.

A few eggs have been found on Shelter Island and a trace at or near Orient Point.

Late in the summer gipsy moths were found in lightly infested portions at Patchogue. Our scouting on the Island has located points within the mentioned sections where spraying will be done in 1922.

It has always been the policy of the Department when any destructive insect appears that all isolated or sporadic outbreaks shall forthwith be eliminated. This policy should be pursued to the end that pests and diseases so expensive in other sections should be controlled promptly and general infections delayed as long as possible.

Scouting for the purpose of locating the area infested by gipsy moth as shown by Inspector Zimmer on Long Island, up to January 1, 1922, is summarized below:

Incomplete reports reveal the finding in Patchogue of 1,000 egg masses of gipsy moth.

The scouting from October to December, inclusive, on the eastern end of Long Island shows the following:

Miles of highway scouted (including 47 miles on Shelter Island)...	195
Apple trees examined.....	21, 285
Shade trees examined.....	31, 620
Woodland scouted (acres).....	100

The whole territory east of Peconic village from the Sound to Peconic Bay was thoroughly covered, including Shelter Island and the village of Riverhead and the main road eastward.

Live egg clusters found and creosoted.....	1, 114
Old egg clusters found.....	1, 429

STANDARD APPLE GRADING LAW

Due to the light crop of apples for the past season, the total quantity being handled in New York State is less than one-third of the previous year.

The shipping season, embracing the crop grown in a given year, begins in the fall and ends the succeeding spring. During the season ending June 1, 1921, 5,168 inspections were made of different lots of apples. From one to ten barrels were opened of each lot. Of these, 4,779 lots were found up to the grade claimed, 304 lots had minor violations and the packer's attention was called to the matter and copies of the law and regulations were supplied, and 85 cases with evidence of violation were sent to the Counsel for action.

In the fall apple-shipping season up to January 1, 1922, a total of 2,185 inspections were made. Of this number 1,880 were found up to grade; 280 were found to have minor violations, to which the packer's attention was called and a copy of the law furnished him; and 25 cases were referred to Counsel as violations of the law.

QUARANTINES

In addition to the corn borer quarantine, other similar orders issued in the past are still in force and relate to blister rust of pines; shipments of pines and ribes from the New England States; Christmas trees and greens (not nursery grown) from moth-infested areas of Massachusetts; and local orders relating to Oriental fruit moth and such as are necessary for special cases of insect control.

APIARY INSPECTIONS

The chapter relating to bee diseases provides definitely just how inspectors shall proceed—first by giving owners instructions for treatment and then requiring follow-up inspection to ascertain if the ordered treatment had been applied, and, if not effective, the inspector should order diseased colonies destroyed.

For three or four years past the work of disease control has devolved on only two inspectors and imposed upon them an impossible task of covering the state as was demanded.

In 1920, and again in 1921, appropriations were provided which enabled the Department to appoint special inspectors for a short period in each year. The inspectors appointed were chosen by a committee of large beekeepers on the ground that they were fully capable.

In 1920 the work began late in the season and in 1921 the follow-up work could not be completed. The following table shows work accomplished in 1921:

Number apiaries inspected.....	2,455
Number colonies inspected.....	62,871
Number diseased by European foulbrood.....	2,656
Number diseased by American foulbrood.....	1,473

Special bee inspection work done in 1921 revealed that the following number of cases of foulbrood were found:

No. of American	No. of European	Counties in which found
5	55	Albany, Greene, New York, Schoharie, Ulster.
111	147	Chemung, Cortland, Tompkins.
65	214	Allegany, Cattaraugus, Chautauqua, Steuben.
21	233	Niagara, Orleans.
5	38	Clinton, Essex, Saratoga, Warren.
19	54	Broome, Delaware, Otsego.
222	576	Franklin, Jefferson, Lewis, St. Lawrence.
147	176	Ontario, Wayne, Yates.
52	117	Livingston, Monroe, Wyoming.
54	180	Columbia, Rensselaer, Schenectady, Washington.
10	19	Nassau, Queens, Richmond, Suffolk.
395	155	Onondaga, Oswego.
163	121	Cayuga, Schuyler, Seneca.
18	91	Dutchess, Putnam, Westchester.
52	36	Fulton, Hamilton, Herkimer, Montgomery, Oneida.
..	58	Orange, Rockland, Sullivan.
25	249	Chenango, Madison, Tioga.
94	112	Erie, Genesee.

COOPERATIVE WORK OF BUREAU INSPECTORS

The permanent location of our inspectors in 15 sections of the state enables them to come in close contact with residents of the several vicinities. Our inspectors are called upon for help, advice, and information on all sorts of horticultural subjects ranging from the care of orchard, park and lawn trees, location of orchards, pruning, culture varieties, etc., to an almost unlimited extent.

In Niagara County for several years our local inspector, in addition to his regular department duties, has conducted a cooperative spraying service in conjunction with the Niagara Farm Bureau. This work has been of much use in cooperative demonstrations.

The results and methods were quite perfected in 1921, and our bulletin on "Spraying for the Control of Apple Scab," gives full details.

Cooperation with the State Entomologist and with the Entomologist of the New York Agricultural Experiment Station at Geneva, show respectively interesting data on codling moth demonstrations and on pear psylla control.

One of the inspectors was brought in close contact with the growers, who asked for cooperation with the Cayuga County Farm Bureau on the use of alfalfa in orchards, on orchard management, and diseases in general.

PATHOLOGICAL WORK

Doctor Sands, on his return from abroad in 1921, met the Director of Agriculture of Bermuda at Riverhead, L. I., as in five previous years, and inspected the fields of Bliss Triumph potatoes grown for export seed to Bermuda and arranged for having requirements carried out for certification prior to shipment. This work covered two months except, incidentally, observation of late crop potatoes brought to the Island from northern New York, Maine, Vermont, and New Hampshire, to ascertain comparative value for seeding on Long Island.

A large number of growers were visited and instructed to guard against late blight along lines of correct methods.

A series of observations were made on soil temperatures, soil moisture, and humus, to correlate with the cause of Fusarium wilt, amplifying experiments started two years ago and fully reported.

In August and September, the digging of Bliss for Bermuda shipments, and sorting and packing requirements were explained to growers. This involved quantitative sorting based on amounts of bacterial rots, ground rots, and infections due to specific fungous parasites.

Certification of potatoes for export to certain South American countries began in early September. This work only covers the freedom of potatoes in the shipments as offered of specific disease organisms causing losses in transit and infectious soil inoculations in the country of export.

These activities dovetailed with each other and with the cucumber variety tests carried on in cooperation with Mr. Fullerton of the Experimental Farm of the Long Island Railroad.

Since, a request for assistance has been made by the Board of Constructing Engineers of the United States Army for advice with regard to planting on certain seaside fortification reservations located at Rockaway Point. It appears that damage by drifting sand is causing heavy losses, erosion, undermining, and equipment losses. The problem is to anchor these sand drifts by the selection of suitable plant floras which will thrive under the adverse growing conditions presented there, and so lead to consequent vegetation.

It is self-evident that little use can be made of material to be bought from nurseries, but that it involves materials gathered in most cases from the wild.

This assistance will be furnished from henceforth as the occasion requires.

As time permitted, minor classical studies were made on the common economic potato diseases, attempting to lead to an explanation of the mosaic, leaf roll, and spindling sprout diseases of potatoes.

While the title of "Bureau of Plant Industry" conveys the broad idea that the scope of its operations cover botanical, pathological, cultural, and scientific phases, and in a not unlimited degree is this so, as daily indicated by the problems submitted for information by a large correspondence and otherwise, yet it should not be lost sight of that primarily we are a regulative organization.

PUBLICATIONS

During 1921, the Bureau issued the following:

Circular No. 199, "European Corn Borer."

Circular No. 202, "Diseases of the Honey Bee."

Circular No. 206, "Inspection, Certification and Transportation of Nursery Stock."

Six spraying charts for the use of fruit growers.

A revision of the Department Potato Bulletin No. 102, now No. 135, was completed.

Work was done on a revision of Bulletin No. 79, "The Fruit Industry of New York."

MISCELLANEOUS

Comments on the more important diseases and insects engaging careful attention of the inspectors of the Bureau, some of which have been recorded in earlier reports, should be noted as a matter of record showing the present state of progress.

Gipsy moth, above referred to, is unquestionably of prime importance at this time. Its close proximity to the eastern border of New York and the long front of about 100 miles of its progress westward indicates a menace of serious importance. In a very few years this question will be one on which a broad state policy for control must be met.

Only 50 miles west of New York City, New Jersey has over 1,000 square miles of gipsy moth territory so thoroughly infested that stripping has been very severe for five years. The serious condition facing us is further complicated by the adverse reports of budget retrenchment just at a time when important precautionary measures should be taken.

EUROPEAN CORN BORER

This insect is now known to be established in eastern New England, eastern and northern New York, and along the shores of Lake Erie as far west as Sandusky, Ohio, southeastern Michigan, and on the Canadian side of Lake Erie easterly to the Niagara River.

The Federal and Canadian governments and the infested states are making strenuous efforts to keep the pest circumscribed; but, owing to the rapid flight of the female moths, the corn belt of the country will ultimately become infested, and will presumably cause much damage.

SAN JOSE SCALE

The San Jose scale, the great pest of the orchardists a dozen years ago, has become less virulent of late; however, the indications of 1921, show that this pest is coming back. No efforts should be spared to obliterate incipient colonies.

ORIENTAL FRUIT MOTH

The Oriental fruit moth is not showing damage in areas in New York where it appeared in 1917.

PINE TREE SHOOT-MOTH

The pine tree shoot-moth is still locally injurious but is not permitted to spread. It is easily controlled by annual pruning of its host trees.

APORIA CRATAEGA

This pierid, found on nursery seedling importations in 1917, has not become established but is frequently found on imported apple seedlings. Efforts to rear them in cages have so far been futile.

CHERRY ERMINE MOTH

In Monroe County 216 apple seedlings were found infested with this insect, and for the first time 100 were found feeding on cherry stocks since its importation in 1916; about 500 were found in all the state.

JAPANESE BEETLE

The Japanese beetle has not been reported except near Camden, New Jersey. It is having a rapid but local spread. This is another new pest to which we are giving attention.

SATIN MOTH

The satin moth found two years ago in the Boston fells has not been found elsewhere in the United States. The Government has placed general quarantine.

BROWN-TAIL MOTH

The brown-tail moth first appeared in Massachusetts in 1890 and spread rapidly over the New England states, causing much damage to trees and plants. From natural causes it practically disappeared throughout the area infested by 1910. The latest reports from Massachusetts indicate that there is danger of further outbreaks, with certainty of rapid spread. In 1910 about 12,000 nests of this insect were found on imported seedlings, but in recent years very few have been found on seedlings and stocks arriving from abroad.

Other insects having potential interest and demanding our inspectors' care, both old and new and all appearing in our records, are: white pine weevil, box leaf-miner, spruce gall aphids, fir saw-fly, holly leaf-miner, bag-worms, leaf crumpler, saw fly, *Euphitis cincti*, etc.

Among diseases, the galls, mostly crown-gall, are found commonly on a great variety of trees, shrubs, and roses. The chestnut blight is gradually possessing the state, destroying all sweet chestnuts in its slow progress.

Black-knot and peach yellows are occasionally ordered cut out when complaints of local damage arise.

BUREAU OF FARM SETTLEMENT

The demand for farms and farm information has been much greater during 1921 than in former years. It has come from all parts of our state, the United States and Canada. The majority of these applicants represent an excellent type of agriculturists who desire to relocate their farming under more favorable conditions, such as New York State offers. Also, owing to the economic conditions prevailing within our cities they are turning to rural occupations and are ready and willing to take up agriculture. Most of these people are eager to take up the moderate priced farms, such as are represented by our bulletin, and to improve them by their own efforts.

LISTED FARMS SOLD

Our 1921 bulletin "Farms for Sale or Rent in New York," contained 3,426 farm descriptions, and of this number 675 were sold, at a total value of \$4,103,250. A detailed statement is given below:

County	Number	Value	County	Number	Value
Albany	27	\$166,750	Onelda	25	128,800
Allegany	11	73,500	Onondaga	13	116,500
Broome	13	65,400	Ontario	8	48,600
Cattaraugus	14	74,300	Orange	28	277,600
Cayuga	21	151,000	Orleans	1	2,500
Chautauqua	17	94,200	Oswego	27	155,800
Chemung	3	12,000	Otsego	23	74,200
Chenango	8	47,600	Putnam	1	2,000
Clinton	5	23,800	Rensselaer	19	136,400
Columbia	18	182,300	Rockland	2	16,000
Cortland	10	75,600	St. Lawrence	13	70,500
Delaware	24	127,600	Saratoga	13	38,900
Dutchess	12	127,000	Schenectady	2	9,000
Erie	7	59,100	Schoharie	15	46,300
Essex	6	39,600	Schuyler	9	38,900
Franklin	9	44,200	Seneca	5	19,500
Fulton	6	15,200	Steuben	13	53,000
Genesee	5	35,000	Suffolk	14	123,200
Greene	29	139,250	Sullivan	24	103,300
Hamilton	1	1,800	Tioga	18	66,000
Herkimer	4	28,300	Tompkins	9	37,900
Jefferson	11	77,100	Ulster	29	158,800
Lewis	19	107,000	Warren	8	50,050
Livingston	6	37,200	Washington	7	34,300
Madison	17	89,100	Wayne	8	53,700
Monroe	11	120,900	Westchester	3	34,000
Montgomery	4	13,500	Wyoming	7	45,300
Nassau	2	12,800	Yates	5	39,600
Niagara	12	81,300			
				675	\$4,103,250

DEMAND FOR BULLETIN

To properly place the advantages of New York State before the prospective settler, we publish a bulletin containing descriptions of a large number of farms which are for sale or rent in our state. It also includes information, agricultural and otherwise, which is of value to one desiring to locate in this state. The demand for them is so extensive that many public institutions, such as libraries, agricultural schools, mercantile institutions, banks and courts, are asking for them and are placing them before the public for reference. So great has been the demand that over 11,000 copies have been distributed.

We now have on file over six hundred (600) descriptions which have been received since the publication of Bulletin No. 139, our 1921 edition. Most of these cover the type of farm most generally sought.

Requests for our services come from various sections and from various classes. They include men from the western counties who desire to locate

in the Hudson River valley; men in the Hudson valley who are eager to settle in the western counties; men from the northern sections who wish to come further south; and men from the cities who are desirous of settling in the country. Many of these requests are from those who wish to sell their present farms and relocate on what we term "one-man farms." In many instances they have reached middle age and wish to be relieved of the responsibility of a large farm.

During the past two years farming in the western states has been badly retarded, and the western farmer is realizing that New York State offers most of the advantages he went west to secure. These farmers are disposing of their western holdings and are coming east as quickly as possible. They are a splendid type of farmers, and since most of them have sons of working age, the labor question is not so serious with them.

Many Canadians are writing us for information. They, too, are anxious to relocate on smaller farms which are located in less isolated places. In some instances they have stated that they were 2,500 miles from market.

In many instances we accompany the sincere prospective settler to farms which we feel are best suited to the kind of farming he wishes to undertake; and to farms which represent the best value for the amount of money he wishes to invest.

The settler, having received his preliminary information from us, naturally appeals to us for assistance in solving questions arising in the course of successful farming operation in a section new to him. Much correspondence has resulted in regard to farms, crops, markets, seeds, help, stock, machinery, etc., to all of which attention has been given to the best of our ability.

SUPPLYING FARM LABOR

The supply of farm hands, skilled and unskilled, has been secured mostly from the New York office, while from this office only experienced men were sent to places where need seemed imperative. Through contact with various state and city institutions, and with American and foreign labor agencies, 1,775 farm labor applicants have called at our offices to be sent out as farm laborers throughout the state. A great number of these men were inexperienced in farm work of any kind, but were willing to be sent to the country if only for a short time. Eight hundred and seventy-three (873) farm hands and eight (8) farmerettes were sent out as general farm workers, milkers, tractor operators, truckmen, gardeners, fruit pickers and packers, etc. Through the aid of several county agricultural agents 285 of these inexperienced men were placed on farms for the summer. Although no direct information has been secured from the farmers as to their placements, yet we have record of over 200 replies from farm hands stating their whereabouts. According to an approximate tabulation, the average farm hand stayed 11 weeks and the average wage, including board, room, and washing, was \$29.50 per month.

The work conducted by the Bureau of Farm Settlement concerning this particular branch has been very highly commended.

IMMIGRATION

Considerable time has been devoted during the year to the difficult task of tabulating, as exactly as possible, the influx and exodus of our foreign population. Frequent visits have been made to Ellis Island and several letters sent to the Department of Labor at Washington, D. C., in an endeavor to secure statistics concerning this vital subject.

During the year 1921 there arrived at the port of New York, by sea or rail from Boston, Philadelphia, and Baltimore, 287,500 aliens, of whom 136,050 were females and 58,000 were children below 16 years of age; 109,306 remained in New York City. The exact number of those skilled in farming industries could not be obtained, but less than 1 per cent of those remaining in New York City were skilled in farming.

Nationality	Remained in New York		Nationality	Remained in New York	
	Arrivals	City		Arrivals	City
Italians	62,500	19,500	Hollanders	11,940	3,200
Poles	44,875	14,450	Hungarians	13,550	3,455
Jews	46,200	29,375	Roumanians	11,875	2,910
Orientalis	19,450	8,750	Greeks	9,540	3,160
Slavonians	18,905	8,300	Scandinavians	7,660	1,850
Spaniards	16,500	5,000	Other nationalities.	11,630	4,656
Germans	12,875	4,700			

"Other nationalities" includes those from England, France, Portugal, Belgium, Armenia, Syria, Hindustan, and the West Indies. Of these arrivals 72% are young and healthy and useful in all kinds of labor, and 85% are without means.

EMIGRATION

There have left this port during the year 1921, 117,850 persons, of whom 49,500 were females and 11,800 children below 16 years of age. As there were among them a number of citizens or declarants who have obtained passports from the Department of State, they could not be classified as aliens. A large number of these have returned to this country, especially among the Italians. It is not possible to give the exact number returning, as United States citizens are not subject to immigration rules on their arrival.

BUREAU OF ANIMAL INDUSTRY

To improve in quality and increase in number the cattle, sheep, horse, and swine population, thereby contributing to the wealth and agricultural resources of the state; and to control and eradicate contagious and infectious diseases of live stock, is the two-fold function of the Bureau of Animal Industry. The protection of sheep from the ravages of dogs, the licensing of stallions, and the inspection of veal, are some of the features of this work.

In view of the deplorable results which may attend the use of the milk from tuberculous cows, it is apparent that the health of this and coming generations demands the most rigid sanitary control of our milk supply.

While a cow affected with tuberculosis may live for years, on the other hand, those who have made a life-long study of this disease state that in many cases it reduces by one-half the productiveness and life of the animal.

New York State ranks second in number and first in the value of its dairy cattle, having 2,081,074 cattle valued at approximately \$194,357,117. It will be seen from these figures that we cannot afford to have this insidious disease eating away the profits derived from one of our greatest industries. The losses caused by bovine tuberculosis necessarily increase the cost of all beef and dairy products. Many dairymen will not introduce animals into their herds unless reasonably sure that the herd from which the purchase is made is tuberculosis-free. This means paying a premium for animals from clean herds. The U. S. Government estimates this premium at \$10 for grade cattle and \$25 for pure-bred cattle. Consider these figures with reference to our cattle population and some idea will be gained of the toll imposed by bovine tuberculosis.

Another important feature of this subject is its bearing on the reputation of the Empire State for producing breeding stock. At present, Cuba, China, Argentina, and other countries frequently make purchases of pure-bred cattle in New York State—this in addition to the large demand from our sister states. It is obvious that failure to supply this trade with tuberculosis-free cattle will mean, first, a reduction in price, and, second, the loss of a market.

TUBERCULOSIS COSTLY

It has been very truthfully said that "While the saving of human life affords the highest motive for combating tuberculosis, the prevention of financial loss is alone a sufficient reason for undertaking the eradication of this disease from farm animals," and, "The sooner bovine tuberculosis is eradicated, the less the work will cost, and the sooner the losses it causes will stop."

Tuberculosis is one of the oldest diseases of cattle of which we have certain record. Its specific cause, the tubercle bacillus, was determined by Robert Koch in 1882; and 1890 marked the discovery, also by Koch, of tuberculin, considered the most reliable agency by means of which to detect tuberculosis in the living animal.

The disease sometimes manifests itself by such symptoms as coughing, extreme emaciation, and enlarged glands; on the other hand, and not infrequently, animals in apparent normal physical condition are found upon being slaughtered to be affected with tuberculosis in the generalized form.

New York State, through its Department of Farms and Markets—originally known as the Department of Agriculture—in accordance with statutes existing from year to year, has worked toward the extirpation of this disease for a period of about eighteen years. However, intensive work did not begin until the spring of 1918. The growth of this work, responsive to popular demand, is evidenced by the following tabulation:

Fiscal year.	Approximate number animals examined.	Approximate number animals rejected.
1917-18	17,525	1,493
1918-19	24,304	2,097
1919-20	48,566	6,842
1920-21	115,505	20,702

ACCREDITED HERD PLAN

In December, 1917, state live stock officials and others in attendance at the annual meeting of the U. S. Live Stock Sanitary Association in Chicago adopted the now well-known accredited herd or honor roll plan of tuberculosis eradication. It may be defined as an organized cooperative effort by the breeders and the state and federal governments, to exterminate tuberculosis from herds and areas by the establishment of herds and areas as tuberculosis-free. To this great work, the state and federal government contribute about equally in man power and financial obligation.

This plan was received enthusiastically in New York State, for at that time our live stock industry was in disrepute, due to reported shipments of tuberculous cattle to other states and consequent quarantine restrictions against New York State cattle. As soon as our state laws had been amended to admit of that course, New York State, through its live stock officials, entered into a working agreement with the U. S. Department of Agriculture, and the work really began.

WORKING OF PLAN

A description of the operation, under normal conditions, of one herd under state and federal supervision in accordance with this project will indicate to those interested the manner in which this work is carried on.

We will say that Mr. A signs agreement in adoption of the accredited herd plan. Upon arrival of that agreement in the Bureau of Animal Industry, it is acknowledged to Mr. A and recorded in a card index showing owner's name and address, county, breed of cattle, and number in herd. A state employed veterinarian or a federal inspector is then detailed to make the initial examination of the herd. This consists of a physical examination and a tuberculin test of each member of the herd, and thereafter the reporting of that examination in detail to this office. If any tuberculous animals are revealed, the veterinarian tags them with "reject" ear tags; he also tags with a "passed" tag, grade animals passing the test. The report of such test upon arrival at this office, after being examined by the Federal Inspector for New York State, is indexed as to all details of the examination and its results. The animals considered diseased are quarantined by written notice to the owner, and any suspects are provisionally quarantined pending reexamination. The Commissioner of Agriculture having ordered the diseased animals killed, their market value is determined by a department appraiser; when slaughtered subject to post-mortem inspection furnished by this Department, the reports of appraisal and post-mortem are also indexed in detail. If any of the diseased animals are pure-breds, registration certificates are required and these are closely checked against the appraisal report. When a salvage report or report of proceeds derived from the hides and any carcasses passing veterinary inspection is made available, and also checked as to numerical correctness and indexed, the papers in the case are assembled and the claim for indemnity computed.

Stables in which the diseased animals were kept are cleansed and disinfected under proper supervision.

Occasionally tuberculous animals of extraordinary worth are not ordered slaughtered but kept in quarantine by their owners with the consent and approval of this Department, and the Federal Government. This course is not sanctioned, however, unless the animals present no symptoms of tuberculosis

in the advanced stages and the owner is considered entirely reliable and has the facilities to surround the diseased animals by safeguards necessary to preventing the spread of the disease.

After this initial test every addition to the herd must first pass two tests at sixty-day intervals and must be reported to this office and recorded here. All removals from the herd must also be reported and recorded in order that this Department shall at all times have a record of each individual in the herd working toward accreditation. Should a large percentage of the herd be found diseased on first test, retest is due in six months, otherwise in twelve months. When the herd has successfully passed two tests at twelve-month intervals or three at six-month intervals, the owner may receive an accredited herd certificate, the advantages of which are many, greatly enhancing the value of the herd and its products.

Ten counties — Allegany, Cattaraugus, Chenango, Essex, Greene, Madison, Onondaga, Otsego, Steuben and Tompkins — are engaged in area work, aiming to test every herd therein and eliminate the diseased animals. In these counties the method of procedure differs in minor details from that followed in the illustrative case, but the general routine is the same. There are about 4,158 herds, aggregating about 83,160 animals under supervision, of which 121 herds are accredited as tuberculosis-free. The magnitude of the work involved, both with reference to field and office force, is very apparent. Furthermore, while tuberculosis is the foremost work of the Bureau, it is by no means the only line of work being carried on; and the case illustrated is a fairly simple one. Many cases of badly diseased herds require far more attention.

This great work has only begun. Larger appropriations, state and federal, are needed. The public demand for a clean milk supply must be answered. The American Veterinary Medical Association, through its committee on bovine tuberculosis, has resolved that, "In America our aim should be total eradication and no better path to this end has been defined than that along which our cooperative work between the federal and state governments is moving."

COMMUNICABLE DISEASE ERADICATION

According to bureau records during the past year, our flocks and herds have been remarkably free from any scourge of sufficient size or intensity to menace the live stock in a community. This we do not attribute to good fortune alone, but to the skilled veterinary service with which New York State is equipped, and the vigilance of the breeders themselves, who have learned to fear such diseases as anthrax and blackleg, and therefore to guard against sources of infection. Particularly is this true of hog cholera and other communicable diseases of swine. The statistical data hereinafter set forth, shows the localities in which anthrax, blackleg, hog cholera, mange, etc., have existed, and the mortality attending outbreaks of such diseases.

Bovine Tuberculosis

Scientists having agreed that bovine tuberculosis often diminishes by half the life and usefulness of the dairy animal; and it having been conceded that the bovine type of this disease is transmitted to the human family, especially to children, it is not strange that measures to extirpate this disease have been regarded as of foremost importance in the work of the Bureau. Aided by federal inspectors and county-employed veterinarians, more than 2¼ times as many cattle were examined for this disease during the past year as during any previous year; and the number of cattle condemned was correspondingly large. These results were attained despite limited appropriations for state and federal indemnities — which meant lapses in the work — difficult of explanation to the breeders. Ten counties, previously mentioned, inaugurated free-area work, hiring their own veterinarians to work in conjunction with state veterinarians and federal inspectors. This admirable arrangement made it possible for state and federal inspectors to devote more

attention to herds in the state at large, and to the conducting of post-mortem examinations and explanation of post-mortem findings to the herd owner. Too much cannot be said in appreciation of the universal response with which this work has been met by the county farm bureaus, every breeders' association, the veterinary profession, and the breeders themselves. There has seemed to be no adverse criticism of the plan other than that based on the inability of the State and Federal Departments to test and retest more rapidly the herds awaiting test or already under supervision. The foundation has been well laid, but a two-fold task remains—to guard against reinfection of the herds which have been accredited, and at the same time to place thousands of other herds on the same footing. The task is a tremendous one but is possible of accomplishment if adequate appropriations are made for its support, and the present cooperation continues unimpaired.

ANIMAL HUSBANDRY

Restocking Herds

The rapid growth of the Accredited Herd Plan of necessity has been attended by the destruction of many cattle, and in some instances entire herds. To aid owners sustaining such losses in promptly finding desirable animals, tuberculosis-free, with which to restock their herds at prices within their means, has come to be one of the most prominent duties of the Bureau. The more fortunate breeder, as well, who has lost no cattle from this scourge, or whose loss was negligible, comes to this Bureau for information respecting the location of salable animals, by means of which to increase his milk production or to carry on the breeding of the particular strain in which he is interested. The fast-growing record of tuberculosis-free herds operated under state and federal supervision affords the answer to such inquiries in most cases. In this way practical aid has been extended to hundreds of breeders, often at times of extreme discouragement and threatened financial disaster.

Educational Work

In connection with free-area work under the accredited herd plan, this Bureau is very frequently called upon to conduct or be represented at meetings held for the purpose of inaugurating this project. This is particularly true of county farm bureau organizations which have been the pioneer agency in bringing before the breeders the value of clean herds. Such meetings, as a rule, develop a discussion of the accredited herd plan and its governing regulations. An average of four days in a month have been devoted to this educational work. Practically every dairy county of the state would be actively engaged in area-work, if funds for indemnities were sufficient, and if adequate field and office force were at our command.

Live Stock Sales

The year was marked by an unusual number of important live stock sales. As would be expected, the majority of the consignors to these sales were herd owners operating under the accredited herd plan. Owing to the unparalleled opportunity which such gatherings afford for competition and rivalry in the breeding of pure-bred stock—to the consequent improvement of the breed itself—and owing to the fact that such sales attract out-of-state buyers, thereby advertising New York State cattle, this Bureau welcomed the opportunity to assist and cooperate in making these sales a success. Three of the most noteworthy of these were the Holstein state sale in Rochester, in January, 1921; the Holstein national sale in Syracuse in June following, and the Guernsey breeders' sale in Albany County in September, 1920. Aided by the sale management, the breeders themselves, and the testing veterinarians, this Bureau—cooperating with the Federal Inspector in charge assigned to New York State—saw to it that the health certificates necessary to admission to such sales were available to accompany each animal to its destination within or without New York State.

Stallion Enrollment

So far as is within the knowledge of the Bureau, supplemented by the results of frequent field investigations, all stallions used for public service are enrolled under the various classes specified by law, and as sound or unsound. While deception is prevented by this means, and much consequent good accomplished, this Bureau again goes on record in favor of the total elimination of the scrub or inferior sire, and the substitution therefor of pure-bred sires, community-owned. The table hereinafter presented shows comprehensively the year's record of stallion enrollments. In connection therewith enrollment fees aggregating \$1,440.50 were turned into the State Treasury.

Veal Inspection

Results of inspection of veal shipments and veal offered for sale are also indicated in the figures at the conclusion of this report. This Bureau favors a modified law governing veal inspection, whereby statutes of this state will more nearly conform to federal meat inspection regulations.

**LICENSING OF DOGS*

Chapter 767 became a law May 13, 1920, repealing the former law and making many changes, one of which provided for the payment for damages alleged to have been done by dogs to horses, cattle, sheep, or swine. Such claims, after appraisal by the assessors, should be sent to the County Treasurer for payment, thereby placing the power to reduce a claim with the Board of Supervisors, after a hearing has been requested by either the claimant or the County Treasurer.

There are 57 counties outside of the city of Greater New York, containing 932 towns and 58 cities which come under the provisions of this article.

All moneys collected by the clerks of the towns and cities are sent to the Treasurer of such county. Of this amount, the state receives 10% for the enforcement of this act.

The statistics herein given are from the records required to be filed with the Department of Farms and Markets.

Census of Dogs

The census of dogs as filed by Town Assessors and Police Department of cities, gives the number of dogs owned outside the city of New York, as 253,409. Hamilton County contains the smallest number of dogs, 451; while Erie County shows the greatest number, 19,847.

Dogs Reported Licensed

Town and city clerks report that 232,986 dogs and 172 kennels have been licensed during the above period.

Receipts and Disbursements from Clerks' Reports

Amount collected for licenses issued.....	\$648,042 94
Amount collected from sale of dogs seized or redeemed.....	4,682 90
Total receipts	\$652,725 84

Disbursements by Clerks

Permitted to Police Pension Fund.....	\$40,472 05
Remitted to County Treasurers.....	612,253 79
Total	\$652,725 84

State Revenue

The state of New York receives 10% of all moneys paid to a County Treasurer pursuant to this act. This revenue for the period covered by this report, should amount to \$61,225.37.

* This report covers the 16 month period beginning March 1, 1920, and ending June 30, 1921.

Indemnities

(Claims paid for damages alleged to have been done by dogs.)

County Treasurers have filed 1,830 certificates of claims for such damages, amounting to \$103,685.92.

Domestic Animals or Fowls	Number killed	Number injured	Number Chased or worried
Sheep or lambs.....	5,181	2,049	17,008
Fowls	247	11	.....
Hares and rabbits.....	36	1	.....
Cattle	45	4	.....
Swine	50	2	.....
Horses	1	.....	.....

Assessors' Bills for Listing of Dogs

The Commissioner of Agriculture is required to approve bills of the assessors for making the census of dogs owned. Such approval was given to 926 bills, amounting to \$37,707.20. It was found necessary to reduce eighty of such claims, as they exceeded the number on the list as filed. For such claims the assessors receive a fee of twenty cents for each dog so listed.

BOVINE TUBERCULOSIS

Number cattle officially examined for tuberculosis.....	115,505
Number cattle rejected as tuberculous by such examinations.....	20,702
Rejected, official examinations, per cent.....	17.8
Post-mortem results.. { Localized cases	16,813
Generalized cases.....	2,191
No lesion cases	1,271
Number rejected as tuberculous, retained in quarantine.....	427
Total appraisal value	\$2,821,006 00
Average appraisal value (dollars only).....	139 00
Total indemnity	\$1,567,845 99
Average indemnity (dollars only).....	77 00
Total salvage value.....	\$402,752 08
Average salvage value (dollars only).....	19 00
Number of herds fully accredited under the accredited herd plan, since its inauguration	121
Approximate number of herds which have successfully passed one test	2,128
Approximate number of herds under supervision.....	4,158

GLANDERS

Number equine animals condemned, appraised and slaughtered by the state	112
Post-mortem results.. { Number non-clinical cases.....	82
Number clinical cases.....	25
Number no lesion cases.....	5
Total appraisal value.....	\$9,140 00
Average appraisal value (dollars only).....	81 00
Total indemnity	7,559 00
Average indemnity	67 50

ANTHRAX

Number of outbreaks reported.....	40
Approximate number of animals vaccinated.....	1,087
Approximate number of deaths.....	107

These outbreaks occurred in the following counties:

Allegany	Clinton	Genesee	Orange	Steuben
Broome	Delaware	Lewis	Oswego	Tioga
Cattaraugus	Erie	Oneida	Richmond	Ulster
Cayuga	Essex	Ontario	St. Lawrence	Wyoming
Chautauqua	Fulton			

BLACKLEG

Number of outbreaks reported.....	40
Approximate number of animals vaccinated.....	557
Approximate number of deaths.....	73

These outbreaks occurred in the following counties:

Allegany	Clinton	Fulton	Otsego
Cattaraugus	Cortland	Genesee	St. Lawrence
Chautauqua	Delaware	Montgomery	Steuben
Chenango	Franklin	Oneida	Ulster

HOG CHOLERA

Number of outbreaks reported.....	47
Approximate number of animals vaccinated.....	1,346
Approximate number of deaths.....	593

These outbreaks occurred in the following counties:

Cayuga	Monroe	Saratoga	Wayne
Dutchess	Oneida	Steuben	Westchester
Erie	Putman	Suffolk	Wyoming
Genesee	St. Lawrence	Ulster	Yates
Livingston			

ACTINOMYCOSIS OR LUMPY JAW

Number of cattle reported affected.....	44
---	----

These cases occurred in the following counties:

Allegany	Chenango	Madison	Steuben
Cattaraugus	Genesee	Monroe	Wyoming
Chautauqua			

SEPTICAEMIA HAEMORRHAGICA

Number of outbreaks reported.....	9
Approximate number of deaths reported.....	27

These outbreaks occurred in the following counties:

Cattaraugus	Chautauqua	Otsego	Wayne
Cayuga	Orange	Suffolk	Westchester

MANGE

Number of outbreaks reported.....	8
-----------------------------------	---

These outbreaks occurred in the following counties:

Allegany	Steuben
Jefferson	Wyoming
Montgomery	Wayne

SCABIES IN SHEEP

Number of outbreaks reported.....	13
-----------------------------------	----

These outbreaks occurred in the following counties:

Cattaraugus	Livingston	Onondaga	Orleans
Chemung	Monroe	Ontario	Wyoming
Genesee	Nassau		

SWAMP FEVER

Swamp fever in horses was reported from the counties of Franklin and St. Lawrence.

STALLION ENROLLMENT

Number of pure-bred stallions enrolled.....	442
Number of other stallions enrolled.....	334
Total	776

Amount of fees to State Treasurer for stallion enrollment.....	\$1,440 50
--	------------

VEAL INSPECTION

Number of seizures.....	226
Included in above seizures were the following: 56 live calves, 815 carcasses, and 19 portions of carcasses.	
Number of cases forwarded to Legal Bureau.....	226

N. B. A seizure consists of one or more calves, or one or more carcasses or portions thereof taken on one occasion.

BUREAU OF STATE INSTITUTION FARMS

STATE INSTITUTION FARMS

The chief work of the Bureau of State Institution Farms is directing the management of the 42 state-owned farms connected with the 37 state institutions and institution sites, as provided by Article 2, Section 12, of the Agricultural Law.

Representatives of this Bureau have visited these farms and the Bureau has made recommendations in regard to their management, the one idea in mind being to improve and develop the farms to the greatest extent and to produce the most food possible toward the maintenance of the inmates of the various institutions and thus reduce the per capita cost.

The purpose of the farms is two-fold: To provide a variety of healthful work fitted to the patients in various degrees of physical and mental capacity; to provide fresh farm products at a reasonable price. During the year ending December 31, 1920, these farms produced farm products to the value of \$1,588,654. The average daily population of these institutions for the year 1920 was 60,240.

These farms are well scattered over the entire state. They vary a great deal in fertility and general condition of the soil, and some are better adapted to one particular crop than another. The recent law allowing the exchange of farm products between institutions has proved to be very beneficial, and allows an institution having a surplus of some particular farm product to exchange it with another institution in need of such products and having a surplus of other goods.

The system of farm accounting as outlined by the State Comptroller is proving very satisfactory, and being uniform for all institutions, provides for comparison of the efficiency of each farm. These reports are particularly useful in indicating where improvements can be made and expenses cut down.

COUNTY ALMSHOUSE FARMS

In accordance with Article 2, Section 12-A of the Agricultural Law, this Bureau has caused an inspection of the various almshouse farms to be made. Copies of the reports of the inspectors and the recommendations of the Commissioner of Agriculture in regard to the management of the farms have been sent to the boards of supervisors in the counties in which inspection has been made. This work has a beneficial effect upon the county farms, in that those in charge of the farms see that the state is interested in the work they are doing and is willing to give them all the assistance possible. A great improvement in the management of many of these farms has been made during the past year.

THE STATE DITCHING MACHINES

The Bureau had charge of the thirteen state-owned ditching machines, which were turned over to this Department November 1, 1919, when the Bureau of Production was abolished. These ditching machines have been operated in the various counties of the state under the management of the Farm Bureau Associations of counties in which the ditchers were located. One mechanic has been employed during the entire year and has helped in keeping the ditchers in working order.

EXTENSION WORK

The Bureau had charge of the extension fund, and in this connection has operated stereomotographs at twenty county fairs and at several agricultural meetings. At these places slides showing the agricultural advantages of New York State and slides showing the value of milk as a food especially for children were used.

The Director of the Bureau superintended the state institutions' exhibits at the State Fair, directed the allotment of spaces to the different state departments and also apportioned the \$5,000 allotment among the various departments.

The Bureau of State Institution Farms put on a cow-judging contest quite similar to the one held the previous year, and yet differing in that the cows exhibited were all from the same herd and were sired by the same herd bull. The results of this contest were similar to the guessing contest of 1918 and brought out the fact that it is very important for the farmer to weigh his milk and keep daily records of each cow if he is to know whether each individual cow is profitable or not. This Bureau has distributed free of charge to all institutions and to farm bureau associations and dairy farms of New York State, milk record sheets especially prepared for keeping such records.

To promote interest in the sheep industry in this state, an exhibit at the State Fair was prepared by this Bureau in which a flock of sheep was exhibited and the entire process of taking the wool from the sheep, washing, carding, spinning it into yarn by the old-style spinning wheel, and weaving it into cloth by means of a hand loom was shown. The cloth thus woven was made into an overcoat and presented to the Lieutenant Governor by the Commissioner of Agriculture. This exhibit attracted much attention.

During the year ending December 31, 1920, the total production of milk on state institution farms was 5,507,635 quarts. The amount of pork produced was 738,375 pounds, and 118,340 bushels of potatoes were raised during this period.

The following is a list of state institutions having farm land, together with farm acreage and population:

State Institution	Population	Size of farm. Acres
Western House of Refuge, Albion	238	92.57
Auburn State Prison, Auburn	1,266	220
New York State School for Blind, Batavia	175	60.7
New York State Soldiers' and Sailors' Home, Bath	851	375.5
Matteawan State Hospital, Beacon	1,089	482.22
New York State Reformatory for Women, Bedford Hills ..	354	195.5
Binghamton State Hospital, Binghamton	3,135	1,363
Brooklyn State Hospital, Brooklyn	1,303	220
Buffalo State Hospital, Buffalo	2,504	183
Central Islip State Hospital, Central Islip	6,019	994
Great Meadow Prison, Comstock	480	998
Dannemora State Hospital, Dannemora	635	134
Clinton Prison, Dannemora	1,128	13,078
New York State Reformatory, Elmira	923	421
Gowanda State Homeopathic Hospital, Collins	1,446	683.81
New York State Training School for Girls, Hudson	448	171
New York State Agricultural and Industrial School, Industry	901	1,432
Thomas Indian School, Iroquois	220	100
Kings Park State Hospital, Kings Park	4,904	834.61
Middletown State Hospital, Middletown	2,423	543
The Institution for Defective Delinquents, Napanoch	210	312
Newark State School for Mental Defectives, Newark	1,107	103.44
St. Lawrence State Hospital, Ogdensburg	2,603	1,219.25
Sing Sing Prison, Ossining	1,480	5
New York State Women's Relief Corps Home, Oxford	211	175
Hudson River State Hospital, Poughkeepsie	4,005	893.58
New York House of Refuge at Randalls Island, Randalls Island, New York City	781	37.5
New York State Hospital for the Treatment of Incipient Pulmonary Tuberculosis, Raybrook	399	516
Rochester State Hospital, Rochester	1,900	269.39
Rome State School for Mental Defectives, Rome	2,302	594.83
Craig Colony for Epileptics, Sonoma	1,634	1,898.54
Syracuse State School for Mental Defectives, Syracuse ..	714	274
Letchworth Village, Thiells	967	2,078.85
Utica State Hospital, Utica	1,952	1,402
Valatie Rome State Colony, Valatie (Under Rome State School for Mental Defectives—Population and acreage included with that institution).		
New York State Hospital for the Care of Crippled and Deformed Children, West Haverstraw	243	98.50
Willard State Hospital, Willard	2,851	1,217
Wingdale Prison (site), Wingdale		618
Manhattan State Hospital, Wards Island	6,319	245
Mohantic Lake Reservation, Yorktown		490
Total	60,240	35,024.79

LEGAL BUREAU

The work of the Legal Bureau consists in advising the Commissioners, Directors of Bureaus, and other persons where necessary as to the law under which they are operating and as to the many phases of its application to the work provided to be done under the Farms and Markets Law, Agricultural Law, and the General Business Law; in corresponding and consulting with attorneys who are appointed by the Attorney-General to try our cases under the provisions of such laws and advising, in many instances, with Farm Bureau Managers as to the application of the law and the different phases of the work which such Bureaus are performing; in advising with and instructing agents of the Department as to the methods to be pursued in getting evidence in cases of violations of any of the above laws; and in examining all the evidence submitted by the Commissioners or the Directors of the different Bureaus for purported or possible violations of any of the said laws.

During the calendar year of 1921 from the evidence submitted to this Bureau from the Division of Agriculture there was found evidence which it was believed warranted the reference to the Attorney-General of 4,548 cases for violations of the provisions of the Agricultural Law, as follows:

Milk	352	
Milk Bottles	129	
Oleomargine	105	
Cream	19	
Pipettes not State Branded	1	
Milk Cans	3	
Evaporated Milk	12	
Nu Krem	3	
Blended Cream	1	Article 3.
Cheese	2	
Renotated Butter	1	
Milk and Cream	1	
Mixing skim bilk with whole milk and selling the resultant product as milk	1	
In relation to dealing or buying cream of produer	1	
Sour Cream	4	
Babcock Method of Testing	2	
Rabies Quarantine	42	
Bob Veal	262	
Tuberculosis Quarantine	7	Article 5.
Quarantine Violation (Lumpy Jaw)	1	
Importation of Cattle	1	
Failure to Enroll Stallion	5	Article 5-A.
Non-license of Dog	2, 985	
Assignment Claims	30	
Violation to restrain order	3	
Failure monthly Report of dog licenses	1	Article 5-B.
Failure to remit dog License fees	1	
Failure to obey order of Justice of Peace	3	
Feeding Stuffs	352	Article 7.
Fertilizers	94	Article 9.
Linseed Oil	2	Article 10.
Turpentine	17	
Misbranded Apples	80	Article 11.
Foul Brood Bees	1	Article 14.
Agricultural Seed	24	Article 15.
	<hr/> 4, 548	Cases.
Penalties collected	\$41, 120 26	

The report made to this office by the Attorney-General for the said calendar year shows as above that that official collected in penalties from the cases referred to him, \$41,120.26.

Some of the evidence submitted to this Bureau was found not to be sufficient to constitute violations of the provisions of the statute. In such instances the papers are sent back to the Bureau from which received with advice to that effect.

Of necessity there have been frequent consultations with the Attorney-General's office relative to the principles involved and the facts constituting the violations in cases referred to him, and oftentimes in relation to affidavits submitted to that official subsequent to the reference of the cases which have a bearing upon the cases or some of the facts in connection therewith. These affidavits sometimes disclose facts or conditions not known at the time of the reference of the cases and require careful consideration before determining whether further action should be taken. When cases are referred by the Attorney-General to local attorneys oftentimes correspondence is necessitated between such attorneys and this Bureau in relation to what the witnesses can testify and what weight such testimony would have viewed from a legal standpoint. Considerable time is also taken in notifying the witnesses in the different cases and having them ready for trial; also in corresponding with the defendant, and in some cases with the manufacturer, notifying them that their goods were exposed for sale in violation of the statute. Other work of a minor nature consists in advising with those interested in preparing bills as amendments to the laws, the enforcement of which comes under the surveillance of the Department of Farms and Markets.

This report does not contain any statements relative to the work of the Legal Bureau in connection with the Division of Foods and Markets.

BUREAU OF ACCOUNTS

The Bureau of Accounts has charge of the administration of state funds and finances in the Division of Agriculture. The report of this bureau follows:

FINANCIAL REPORT DIVISION OF AGRICULTURE

STATEMENT OF APPROPRIATIONS AND EXPENDITURES FOR THE FISCAL YEAR JULY 1, 1920 — JUNE 30, 1921

Chapter	Title	Appropriations	Total	Expended	Total	Balance June 30, 1921	Total
165-1-1920	Personal Services: Counsel and secretary	\$7,500 00		\$7,291 69		\$208 31	
165-1-1920	Employees	352,280 00		332,590 29		19,689 71	
165-1-1920	Salaries, temporary			17,494 00		6 00	
176-2-1921	Veterinarians	17,500 00		3,335 54		184 61	
165-1-1920	Veterinarians and appraisers	3,335 54		2,000 00		2,257 50	
165-1-1920	Appraisers	2,000 00		1,207 50		58 00	
650-2-1921	Extension lecturers	3,465 00		3,682 00			
165-1-1920	Extension lecturers	3,750 00					
165-1-1920	Operation and demonstration of ditchers and tractors	6,500 00		6,454 92		45 08	
165-1-1920	Inspectors	1,400 00		245 00		1,155 00	
165-1-1920	Inspection		\$390,780 64		\$374,176 33		\$23,604 21
165-1-1920	Maintenance and Operation:						
165-1-1920	Printing general	\$15,000 00		\$11,553 31		\$3,446 69	
165-1-1920	Printing departmental reports	35,000 00		26,418 49		8,581 51	
165-1-1920	Advertising	2,000 00		211 15		1,788 85	
165-1-1920	Equipment and supplies	14,000 00		13,809 40		190 60	
165-2-1920	Equipment and supplies	1,073 27		1,071 76		1 51	
165-1-1920	Traveling expenses	120,000 00		110,028 10		9,971 90	
165-2-1920	Traveling expenses	5,517 74		5,517 74			
165-1-1920	Communication	17,000 00		14,549 50		2,450 50	
165-5-1920	J. Horn & Son	190 75				190 75	
165-5-1920	Fixed Charges and Contributions:		\$209,781 76		\$183,159 45		\$26,622 31
165-1-1920	Farm department	\$34,800 00		\$33,000 00		\$1,800 00	
165-1-1920	Home department	17,500 00		14,068 90		3,431 10	
165-1-1920	Expenses annual conference	3,200 00		3,193 85		6 15	
165-1-1920	Diseases of animals (Glanders ind.)	20,000 00		5,287 50		14,712 50	
165-5-1920	Diseases of animals (Glanders ind.)	1,688 12		928 75		759 37	
176-5-1921	Diseases of animals (Glanders ind.)	45,053 44		304 00		44,749 44	
176-5-1921	Diseases of animals (Equine)	4,076 00		511 00		3,565 00	
176-5-1921	Diseases of animals (Bovine)	3,190 25		3,190 25			
165-1-1920	Retired employees	\$2,000 00		\$933 27		\$1,016 73	
165-1-1920	Indemnities, tuberculosis	150,000 00		150,000 00			
165-5-1920	Indemnities, tuberculosis	4,270 14		4,270 14			
165-5-1920	Indemnities, tuberculosis	8,481 42		8,481 42			
17-1-1921	Indemnities, tuberculosis	703,819 22		703,819 22			
176-2-1921	Indemnities, tuberculosis	100,000 00		74,268 10		25,731 90	
177-1-1919	Indemnities, tuberculosis	19 55		19 55			
177-2-1919	Indemnities, tuberculosis	64 43		64 43			
165-1-1920	Interest on indemnities	5,000 00		4,821 31		178 69	
644-5-1919	Interest on indemnities	8,278 26		8,278 26			
177-5-1919	Interest on indemnities	2,865 51		2,865 51			
347-1-1921	Ditching machines	1,149 49		307 00		842 49	
176-2-1921	Eradication of bee diseases	5,000 00				5,000 00	
165-1-1920	Fixed Charges and Contributions:		\$129,507 81		\$80,484 25		\$69,023 56

FINANCIAL REPORT — Concluded

Chapter	Title	Appropriations	Total	Expended	Total	Balance June 30, 1921	Total
165-1-1920	Services and expenses enf. rabies quar.	15,000 00		3,172 97		11,827 03	
165-2-1920	Services and expenses enf. rabies quar.	5,000 00		3,104 33		1,895 67	
165-1-1920	General plant service.	1,500 00		345 78		1,154 22	
165-1-1920	Rents.	4,152 00		3,895 07		766 93	
165-5-1920	Licensing of dog fees.	17,453 10		204 40		17,248 70	
165-5-1920	Licensing of dog indemnities.	36,241 38		549 00		35,692 38	
650-4-1921	Reconstructing building.	6,811 05		555 85		6,255 20	
165-5-1920	European corn borer (temporary loan).	9,565 62		5,275 67		4,289 95	
701 - 1921	European corn borer.	52,000 00				52,000 00	
176-2-1921	European corn borer.	25,000 00				25,000 00	
165-5-1920	Public market, Ogdensburg (acq. of site of construction).	10,254 12		10,024 31		229 81	
406 - 1919	N. Y. Milk and Child Health Exhibit.	6,000 00		5,321 04		678 96	
176-5-1921	Extirmination of foul brood in bees.	10,000 00		6,798 70		3,201 30	
176-2-1921	Agricultural fairs.	250,000 00		250,000 00			
176-2-1921	Diseases of plants.	397 03		369 83		27 10	
176-2-1921	Carolina Chemical Company.	25 00		25 00			
176-2-1921	New York State Commission expenses.	500 00		194 34		305 66	
176-2-1921	Eradication of Erysey moth.	25,000 00		1,759 43		23,240 53	
	Totals chargeable to fiscal year — July 1, 1920 — June 30, 1921.		\$1,465,847 32		\$1,249,294 02		\$216,553 30
			\$2,202,917 43		\$1,867,084 05		\$335,833 38

BALANCES OF APPROPRIATIONS IN FORCE JULY 1, 1920, WITH EXPENDITURES CHARGEABLE TO PRIOR YEARS

Chapter	Title	Balance July 1, 1920	Total	Expended	Total	Balance	Lapsed
77-1-1919	Personal Service: Extension lect.	\$1,619 50		\$1,579 00		\$40 50	Lapsed April 12, 1920.
77-1-1919	Inspectors.	1,169 00		1,294 00		875 00	Lapsed April 12, 1920.
	Maintenance and Operation:		\$2,788 50		\$1,873 00		
177-1-1919	Printing general.	\$3,069 36		\$2,515 34		\$554 02	Lapsed April 12, 1920.
177-1-1919	Printing departmental reports.	25,620 02		25,620 02			Lapsed April 12, 1920.
177-1-1919	Advertising.	2,257 43		57 15		2,200 28	Lapsed April 12, 1920.
177-1-1919	Traveling expenses.	114 49		72 41		42 08	Lapsed April 12, 1920.
177-1-1919	Communication.	2,583 32		970 52		1,612 80	Lapsed April 12, 1920.
	Fixed Charges and Contribution:		\$33,644 62		\$29,235 44		
177-1-1919	Farm bureau.	\$650 00		\$50 00		\$600 00	Lapsed April 12, 1920.
177-1-1919	Home demonstration agents.	6,751 04				6,751 04	Lapsed April 12, 1920.
177-1-1919	Expenses annual conference.	42 95		25 00		17 95	Lapsed April 12, 1920.
177-1-1919	Services and expenses enf. rabies quar.	899 10		895 75		3 35	Lapsed April 12, 1920.
644-2-1919	Services and expenses enf. rabies quar.	2 26				2 26	Lapsed April 12, 1920.
177-1-1919	Rents.	745 32		5 00		740 32	Lapsed April 12, 1920.
177-5-1919	Services and expenses.	294 40		233 93		60 47	Lapsed April 12, 1920.
	Totals chargeable to years prior to July 1, 1920.		\$9,385 07		\$1,209 68		
			\$45,818 19		\$32,318 12		
					\$13,500 07		Lapsed April 12, 1920.

NEW YORK STATE CROP REPORT

Estimates prepared by the State Department of Farms and Markets on production in the state for 1921, of wheat, potatoes, corn, beans, cabbage, buckwheat, barley, rye, oats, hay, onions and fruit.

The following shows production in New York State, as estimated for 1921, in comparison with that of 1920 of the above commodities:

Commodity	Production		Value	
	1921	1920	1921	1920
Winter wheat.....	7,921,859 bu.	7,958,993 bu.	\$10,694,509 65	\$13,928,238
Spring wheat.....	324,495 bu.	306,357 bu.	373,169 25	536,125
Potatoes.....	30,924,088 bu.	36,522,563 bu.	34,016,496 80	43,096,624
Corn for grain.....	17,092,790 bu.	11,634,492 bu.	11,110,313 50	13,496,010
Beans.....	1,771,292 bu.	1,702,666 bu.	9,742,106 00	5,959,331
Cabbage.....	319,290 tons	597,739 tons	9,578,700 00	18,398,406
Buckwheat.....	4,426,315 bu.	4,570,775 bu.	4,647,630 75	6,399,085
Barley.....	1,629,851 bu.	2,101,146 bu.	961,612 09	2,080,134
Rye.....	1,537,427 bu.	1,736,052 bu.	1,506,678 46	2,742,962
Oats.....	29,236,883 bu.	40,881,620 bu.	11,694,753 20	27,390,685
Apples (Com'l Crop)....	6,973,763 bu.	20,302,361 bu.	10,460,644 50	15,226,774
Pears.....	1,274,398 bu.	2,247,266 bu.	3,823,194 00	2,359,629
Peaches.....	1,201,903 bu.	2,265,783 bu.	3,004,757 50	5,098,011
Grapes.....	42,932 tons	110,833 tons	6,010,480 00	11,083,300
Onions.....	1,831,294 bu.	3,064,122 bu.	3,204,764 50	4,022,278
Hay.....	4,042,529 tons	5,315,136 tons	80,850,580 00	125,437,209
Total value.....			<u>\$201,680,390 20</u>	<u>\$296,254,801</u>

The total value of production of the commodities listed in 1920 was \$296,254,801, while the total value of these commodities in 1921 dropped to \$201,680,390. The total production in general, showed a slight falling off, but the decrease in the total value of products is due, largely, to deflation in prices obtained by producers.

The report shows, however, that New York State held its own during 1921, in the matter of production. The estimates were prepared through the agents-in-charge in the various districts of the state and submitted to the Department. This is the second year that this plan has been followed, and the agents-in-charge and agents working under their direction were much more proficient in supplying the figures for 1921 than for 1920.

The report for 1920 showed production by counties, but did not contain total acreages nor total values by counties. The 1921 figures show the acreage, the production, average production per acre, and the value by counties; and the total acreage, production and value for the State. The figures prepared by the Bureau are conservative in every case, and every effort was made to insure accuracy.

The above figures show that in 1920, the total production of winter wheat was 7,958,993 bushels, while in 1921 the total for the State was 7,921,859 bushels. A shrinkage in the value of winter wheat of more than three million dollars is also shown. The figures obtained by the Bureau show an average production for winter wheat of 21 bushels per acre.

Spring wheat, for 1921, shows a slight increase in production over 1920, but the total value for the State falls off about 30%. The average production per acre for the State was 16 bushels.

While there were indications early in the season of 1921 that the potato crop would fall off heavily, favorable weather in mid-summer developed the crop to such an extent that in comparison with 1920 it showed a falling off

of only about five and one-half million bushels. The average production per acre for the State was 85 bushels. As in other cases, however, the total value for potatoes produced in 1921, was around nine million dollars less than the value in 1920.

GOOD SHOWING IN CORN

The corn crop for 1921 made the best showing of any of the staple crops. A total of 17,092,790 bushels was produced in the State, with an average per acre of 45 bushels. The total crop in 1920 was 11,634,492 bushels, according to the State figures. The total value, however, of the 1921 corn crop was less than the smaller crop of 1920.

The bean production in the State for 1921 was about the same as that of 1920. Beans brought a better price than last year, so that the total value is nearly double the total of 1920.

Cabbage shows a total for 1921 of 319,290 tons, with an average production of 8 tons per acre, and a total value of \$9,578,700. In 1920, the total production of the State was 597,739 tons, but with the higher price prevailing, the total value was \$18,398,406.

The total for buckwheat in 1921 compares favorably with that for 1920, but the total value of the crop in the State falls off considerably, due to the deflation in price.

Barley shows a falling off of some 400,000 bushels in 1921, compared to 1920, and a falling off in value of more than a million dollars.

Oats was a banner crop in 1920, with a total of 40,881,620 bushels and although the total dropped to 29,236,883 bushels in 1921, this was an excellent crop for the State. The total value of oats dropped from \$27,390,685, in 1920, to \$11,694,753, in 1921. This is due, as in other cases, to lower prices obtained for this commodity.

FRUIT PRODUCTION LESS

The reports on fruit show a falling off in all sections of the State, although the fruit counties in the Hudson River district kept fairly well up to the standard. In 1920, the total commercial crop of apples was 20,302,361 bushels, while the commercial crop of 1921 totaled only 6,973,763 bushels. Pears were only fifty per cent crop compared to 1920 and peaches fell off heavily; all due to weather conditions. While it was estimated that grapes had totaled about twenty-five per cent of the 1920 crop, the figures show that the percentage was a little larger, a heavy decrease being registered. The crop in 1920 totaled 110,833 tons, while the estimate for 1921 was 42,932 tons.

A heavy decrease in the hay crop for 1921, compared with the total for 1920, is shown. In 1920, the total amount of hay produced was 5,315,136 tons, while in 1921 the total was 4,042,529 tons, with an average per acre of .9 of a ton. The falling off was due to weather conditions, which affected, particularly, the northern counties of the State where the production of hay is usually heavy.

Onions is another crop which showed a decrease in 1921 as compared to 1920, the total for 1920 being 3,054,122 bushels, while in 1921 it was 1,831,294 bushels, with an average production of 180 bushels per acre. The value in 1921, as compared to the value in 1920, is not in ratio with the decrease in production, the 1921 value being \$3,204,764, while the value of the larger crop in 1920 was \$4,022,278.

The figures in the table which follows in this report show the acreage, production, average production, and total value, by counties.

Monroe County leads in the production of winter wheat, with a total of 1,104,000 bushels. Livingston County is a close second with a total of 1,067,800 bushels, and Ontario County is third, with 682,500 bushels.

St. Lawrence County leads in the production of spring wheat, with a total of 51,000 bushels; Jefferson County is second with a total of 38,500 bushels, and Franklin County is third, with 25,200 bushels.

SUFFOLK LEADS IN POTATOES

Suffolk County leads in the production of potatoes, with 4,000,000 bushels, while Steuben County is second with 2,700,000 bushels, and Nassau County is third, with 1,400,000 bushels.

Monroe County leads in the production of corn for grain with 1,937,360 bushels. Franklin County is second, with 900,000 bushels, and Livingston County is third, with 890,200 bushels.

Livingston County leads in the production of beans, with a total of 426,720 bushels, while Wayne County is second, with 310,000 bushels, and Ontario County is third, with 147,000 bushels.

Wayne County leads in the production of cabbage, with 43,625 tons, while Monroe County is second, with 27,440 tons, and Onondaga County is third, with 25,000 tons.

Steuben County leads in buckwheat, with a total of 292,500 bushels. Schoharie County is second, with 260,000 bushels, and Albany County is third, with 200,000 bushels.

In the production of barley, Ontario County leads with 150,000 bushels, while Monroe County is second, with 125,000 bushels, and Onondaga County is third, with 99,000 bushels.

Jefferson County leads in the production of oats, with 2,044,000 bushels, while St. Lawrence County is second, with 1,800,400 bushels, and Lewis County is third with 1,069,950 bushels.

Orange County leads in the production of onions, with 600,000 bushels. Wayne County is second, with 240,000 bushels, and Madison County is third, with 220,000 bushels.

Although St. Lawrence County usually leads in the production of hay, Onondaga County leads, with 168,600 tons, while Delaware County is second with 155,000 tons, and Otsego County is third, with 147,500 tons. St. Lawrence County produced in 1921 only 108,460 tons. In 1920, St. Lawrence County produced 244,772 tons of hay.

APPLES IN MONROE

Monroe County leads in the production of apples with 1,682,000 bushels, while Wayne County is second with 1,500,000 bushels. Niagara County stands third with a total of 650,000 bushels.

Niagara County leads in the production of peaches with 360,000 bushels, and Orleans County is second in the production of peaches with 310,000 bushels, while Monroe County is third with 225,876 bushels.

Chautauqua County produced the greatest amount of grapes, with a total of 15,250 tons, while Yates County was second with a total of 7,000 tons, and Ulster County was third with a total of 4,500 tons.

The following table shows the production per acre, production and value by counties for 1921, and also the total production for the State:

WINTER WHEAT

<i>County</i>	<i>Acres</i>	<i>Bushels</i>	<i>Av. Prod.</i>	<i>Total Value</i>
Albany	600	10,200	17	\$13,770
Allegany	2,500	37,500	15	50,625
Broome	977	23,500	24	31,726
Cattaraugus	204	4,080	20	5,508
Cayuga	20,600	327,600	16	442,260
Chautauqua	750	15,000	20	20,250
Chemung	2,800	58,800	21	79,380
Chenango	297	5,940	20	8,019
Clinton .....	.....	.....	.....	.....
Columbia	600	10,200	17	13,770
Cortland	450	10,000	22	13,500
Delaware	125	2,125	17	2,868
Dutchess	1,000	19,000	19	25,650
Erie	15,000	350,000	23	472,500
Essex	50	850	17	1,147
Franklin .....	.....	.....	.....	.....
Fulton	25	425	17	573
Genesee	37,500	675,000	19	911,250
Greene	1,000	18,000	18	24,300
Hamilton .....	.....	.....	.....	.....
Herkimer	70	1,100	16	1,485
Jefferson	150	3,290	21	4,441
Lewis	105	1,575	15	2,126
Livingston	46,716	1,067,800	22	1,441,530
Madison	1,200	24,000	20	32,400
Monroe	55,200	1,104,000	20	1,490,400
Montgomery	850	14,450	17	19,507
Nassau	200	5,500	27	7,425
Niagara	41,450	510,000	12	688,500
Oneida	1,000	27,000	27	36,450
Onondaga	8,750	175,000	20	236,250
Ontario	32,500	682,500	21	921,375
Orange	2,300	48,300	21	65,205
Orleans	19,500	345,000	17	465,750
Oswego	1,800	35,500	19	47,925
Otsego	300	6,000	20	8,100
Putnam	35	595	17	803
Queens .....	.....	.....	.....	.....
Rensselaer	200	3,400	17	4,590
Richmond .....	.....	.....	.....	.....
Rockland	100	1,800	18	2,430
St. Lawrence .....	.....	.....	.....	.....
Saratoga	250	4,000	16	5,400
Schenectady	15	270	18	364
Schoharie	825	15,675	19	21,161
Schuyler	6,500	149,500	23	201,825
Seneca	21,500	344,000	16	464,400
Steuben	8,000	190,000	23	256,500
Suffolk	3,000	65,500	21	88,425
Sullivan	150	3,000	20	4,050
Tioga	1,677	36,894	22	49,806
Tompkins	6,400	153,600	23	207,360
Ulster	3,500	66,500	19	89,775
Warren	20	340	17	459
Washington	450	6,750	15	9,112
Wayne	25,500	561,000	22	757,350
Westchester	325	2,875	8	3,881
Wyoming	15,498	385,925	24	520,998
Yates	14,000	311,000	22	419,850
Total	404,439	7,921,859	21	\$10,694,503

SPRING WHEAT

<i>County</i>	<i>Acres</i>	<i>Bushels</i>	<i>Av. Prod.</i>	<i>Total Value</i>
Albany	150	2,400	24	\$2,760
Allegany	1,000	13,000	13	14,950
Broome	225	5,320	24	6,118
Cattaraugus	240	4,800	20	5,520
Cayuga	300	3,000	10	3,450
Chautauqua	150	3,000	20	3,450
Chemung	150	1,200	8	1,380
Chenango	53	750	18	862
Clinton	1,250	15,000	12	17,250
Columbia	375	5,625	15	6,468
Cortland	110	2,100	19	2,415
Delaware	75	1,200	16	1,380
Dutchess	75	1,350	18	1,552
Erie	300	5,700	19	6,555
Essex	300	4,500	15	5,175
Franklin	2,000	25,200	12	28,980
Fulton	25	375	15	431
Genesee .....	.....	.....	.....	.....
Greene	50	850	17	977
Hamilton .....	.....	.....	.....	.....
Herkimer	260	4,200	16	4,830
Jefferson	1,500	38,500	25	44,275
Lewis	225	4,050	18	4,657
Livingston	960	18,000	18	20,700
Madison	300	4,500	15	5,175
Monroe	430	4,300	10	4,945
Montgomery	180	2,880	16	3,312
Nassau .....	.....	.....	.....	.....
Niagara	421	4,800	11	5,520
Oneida	400	15,000	37	17,250
Onondaga	533	7,500	14	8,625
Ontario	220	2,860	13	3,289
Orange	250	4,750	19	5,462
Orleans	75	1,450	19	1,667
Oswego	500	8,500	17	9,775
Otsego	785	14,130	18	16,249
Putnam	15	240	16	276
Queens .....	.....	.....	.....	.....
Rensselaer	50	800	16	920
Richmond .....	.....	.....	.....	.....
Rockland	40	680	17	782
St. Lawrence	3,400	51,000	15	58,650
Saratoga .....	.....	.....	.....	.....
Schenectady	10	160	16	184
Schoharie	100	1,600	16	1,840
Schuyler	150	2,250	15	2,587
Seneca	500	5,000	10	5,750
Steuben	900	13,500	15	15,525
Suffolk .....	.....	.....	.....	.....
Sullivan	100	1,700	17	1,955
Tioga	189	2,825	16	3,248
Tompkins	250	3,750	15	4,312
Ulster	150	2,700	18	3,105
Warren	20	320	16	368
Washington	75	1,200	16	1,380
Wayne	100	2,000	20	2,300
Westchester	38	980	25	1,127
Wyoming .....	.....	.....	.....	.....
Yates	200	3,000	15	3,450
Total	20,154	324,495	16	\$373,163

CORN FOR GRAIN

<i>County</i>	<i>Acres</i>	<i>Bushels</i>	<i>Av. Prod.</i>	<i>Total Value</i>
Albany	7,850	368,950	47	\$239,817
Allegany	3,351	87,126	26	56,631
Broome	750	33,000	44	21,450
Cattaraugus	790	24,050	30	15,632
Cayuga	5,500	192,500	35	125,125
Chautauqua	8,250	330,000	40	214,500
Chemung	3,000	120,000	40	78,000
Chenango	1,832	96,154	52	62,500
Clinton	2,983	178,980	60	116,337
Columbia	15,225	593,775	39	385,953
Cortland	500	25,000	50	16,250
Delaware	1,950	97,500	50	63,375
Dutchess	15,900	731,400	46	475,410
Erie	13,000	780,000	60	507,000
Essex	2,400	105,200	48	68,380
Franklin	16,000	900,000	56	585,000
Fulton	2,170	108,500	50	70,525
Genesee	6,000	300,000	50	195,000
Greene	6,500	318,500	49	207,025
Hamilton				
Herkimer	1,000	50,000	50	32,500
Jefferson	150	6,000	40	3,900
Lewis	3,350	150,750	45	97,987
Livingston	35,620	990,200	25	578,630
Madison	1,200	60,000	50	39,000
Monroe	27,164	1,937,360	71	1,259,284
Montgomery	4,410	211,680	48	137,592
Nassau	6,000	198,200	33	128,830
Niagara	3,322	166,100	50	107,965
Oneida	3,000	150,000	50	97,500
Onondaga	12,000	600,000	50	390,000
Ontario	16,000	480,000	32	312,000
Orange	12,000	540,000	45	351,000
Orleans	5,200	205,000	39	133,250
Oswego	3,000	158,500	52	103,025
Otsego	5,500	247,500	45	160,875
Putnam	1,475	73,750	50	47,937
Queens				
Rensselaer	10,000	480,000	48	312,000
Richmond	60	305	5	198
Rockland	2,150	94,600	44	61,490
St. Lawrence	10,000	504,000	50	327,600
Saratoga	9,800	460,600	47	299,390
Schenectady	2,650	111,300	42	72,345
Schoharie	2,890	138,720	48	90,168
Schuyler	2,500	102,500	41	66,625
Seneca	5,600	196,000	35	127,400
Steuben	6,000	240,400	40	156,260
Suffolk	13,600	800,000	59	520,000
Sullivan	3,750	172,500	46	112,125
Tioga	1,200	66,000	55	42,600
Tompkins	2,600	143,000	55	92,950
Ulster	10,000	470,000	47	305,500
Warren	2,200	92,400	42	60,060
Washington	12,000	588,000	49	382,200
Wayne	15,000	450,000	30	292,500
Westchester	5,706	129,790	22	84,363
Wyoming	1,450	57,000	39	37,050
Yates	7,000	280,000	40	182,000
Total	379,498	17,092,790	45	\$11,110,309

BUCKWHEAT

<i>County</i>	<i>Acres</i>	<i>Bushels</i>	<i>Av. Prod.</i>	<i>Total Value</i>
Albany	10,000	200,000	20	\$210,000
Allegany	13,000	182,000	14	191,100
Broome	6,394	95,906	15	100,701
Cattaraugus	7,526	88,850	12	93,292
Cayuga	6,300	113,400	18	119,070
Chautauqua	4,650	92,000	19	96,600
Chemung	8,800	136,800	15	143,640
Chenango	4,600	55,930	12	56,726
Clinton	2,000	30,000	15	31,500
Columbia	4,120	94,760	23	99,498
Cortland	4,000	100,000	25	105,000
Delaware	6,500	123,500	19	129,675
Dutchess	5,750	143,750	25	150,937
Erie	1,600	58,000	36	60,900
Essex	1,600	25,600	16	26,880
Franklin	2,500	50,000	20	52,500
Fulton	2,500	50,000	20	52,500
Genesee	800	18,000	22	18,900
Greene	4,500	90,000	20	94,500
Hamilton				
Herkimer	1,500	50,000	33	52,500
Jefferson	2,000	30,470	15	31,993
Lewis	650	12,958	19	13,605
Livingston	2,300	42,281	18	44,395
Madison	6,500	117,000	18	122,850
Monroe	1,180	29,500	20	30,975
Montgomery	4,500	76,500	17	80,325
Nassau				
Niagara	1,667	28,000	16	29,400
Oneida	4,600	40,000	9	42,000
Onondaga	4,000	72,000	18	75,600
Ontario	2,500	50,000	20	52,500
Orange	1,875	37,500	20	39,375
Orleans	1,100	17,500	16	18,375
Oswego	3,800	78,000	20	81,900
Otsego	8,000	152,000	19	159,600
Putnam	375	8,625	23	9,056
Queens				
Rensselaer	3,200	67,200	21	70,560
Richmond				
Rockland	225	4,050	18	4,252
St. Lawrence	3,500	52,000	15	54,600
Saratoga	6,500	110,500	17	116,025
Schenectady	2,925	61,425	21	64,496
Schoharie	13,000	260,000	20	273,000
Schuyler	6,000	90,000	15	94,500
Seneca	3,500	63,000	14	66,150
Steuben	15,000	292,500	19	307,125
Suffolk				
Sullivan	3,780	71,820	19	75,411
Tioga	9,613	192,260	20	201,873
Tompkins	8,400	184,800	22	194,040
Ulster	5,500	99,000	18	103,950
Warren	1,700	28,900	17	30,345
Washington	2,500	52,500	21	55,125
Wayne	4,500	81,000	18	85,050
Weatchester	40	530	13	556
Wyoming	4,000	80,000	20	84,000
Yates	2,000	44,000	22	46,200
Total	239,470	4,426,315	18	\$4,647,626

BARLEY

<i>County</i>	<i>Acres</i>	<i>Bushels</i>	<i>Av. Prod.</i>	<i>Total Value</i>
Albany	150	3,150	21	\$1,858
Allegany	5,000	85,000	17	50,150
Broome	637	11,480	18	6,773
Cattaraugus	800	18,400	23	10,856
Cayuga	3,000	48,000	16	28,320
Chautauqua	1,175	25,850	22	15,251
Chemung	1,000	22,000	22	12,980
Chenango	850	16,150	20	9,528
Clinton	1,655	49,650	30	29,293
Columbia	100	2,100	21	1,239
Cortland	500	15,000	30	8,850
Delaware	200	4,200	21	2,478
Dutchess	50	1,100	22	649
Erie	250	7,500	30	4,425
Essex	300	6,600	22	3,804
Franklin	1,700	39,000	23	23,010
Fulton	50	1,000	20	590
Genesee	3,000	85,000	28	50,150
Greene	60	1,200	20	708
Hamilton				
Herkimer	700	20,500	29	12,095
Jefferson	300	7,800	26	4,602
Lewis	1,000	25,780	25	15,210
Livingston	3,200	76,080	23	44,887
Madison	3,000	75,000	25	44,250
Monroe	5,000	125,000	25	73,750
Montgomery	100	2,400	24	1,416
Nassau				
Niagara	3,333	60,000	18	35,400
Oneida	2,100	25,000	12	14,750
Onondaga	6,600	99,000	15	58,410
Ontario	7,000	150,000	21	88,500
Orange	75	1,350	18	796
Orleans	3,000	35,000	12	20,650
Oswego	800	12,000	15	7,080
Otsego	1,000	23,000	23	13,570
Putnam	30	420	14	247
Queens				
Rensselaer	100	2,000	20	1,180
Richmond				
Rockland				
St. Lawrence	3,400	68,000	20	40,120
Saratoga	100	2,400	24	1,416
Schenectady	50	1,300	26	767
Schoharie	650	13,000	20	7,670
Schuyler	1,200	25,000	21	14,750
Seneca	3,550	53,250	15	31,417
Steuben	5,200	93,600	18	55,224
Suffolk				
Sullivan	50	1,000	20	590
Tioga	528	8,416	16	4,965
Tompkins	2,600	41,600	16	24,544
Ulster	125	2,375	19	1,401
Warren	50	800	16	472
Washington	200	4,000	20	2,360
Wayne	400	10,000	25	5,900
Westchester	21	400	19	236
Wyoming	2,000	60,000	30	35,400
Yates	2,400	62,000	25	36,580
Total	80,337	1,629,851	20.3	\$961,607

RYE				
County	Acres	Bushels	Av. Prod.	Total Value
Albany	8,500	85,000	10	\$83,300
Allegany	800	10,000	12	9,800
Broome	650	12,000	18	11,760
Cattaraugus	116	2,132	18	2,089
Cayuga	500	6,000	12	5,880
Chautauqua	150	1,960	13	1,920
Chemung	2,500	40,000	16	39,200
Chenango	225	3,700	16	3,625
Clinton	150	3,750	25	3,675
Columbia	14,850	193,050	13	189,189
Cortland	100	1,600	15	1,470
Delaware	200	2,800	14	2,744
Dutchess	2,500	30,000	12	29,400
Erie	1,400	31,150	22	30,527
Essex	100	1,200	12	1,176
Franklin	700	14,500	20	14,210
Fulton	200	2,600	13	2,548
Genesee	250	37,500	15	36,750
Greene	2,850	37,050	13	36,300
Hamilton				
Herkimer	200	3,000	15	2,940
Jefferson				
Lewis	245	4,410	18	4,321
Livingston	4,200	84,000	20	82,320
Madison	90	1,350	15	1,323
Monroe	3,105	55,890	18	54,772
Montgomery	250	3,500	14	3,430
Nassau				
Niagara	1,250	21,000	16	20,580
Oneida	600	6,850	11	6,713
Onondaga	500	7,000	14	6,860
Ontario	4,000	64,000	16	62,720
Orange	2,200	30,800	14	30,184
Orleans	925	11,100	12	10,878
Oswego	3,500	40,500	11	39,690
Otsego	125	1,750	14	1,715
Putnam	225	2,925	13	2,866
Queens				
Rensselaer	12,500	150,000	12	147,000
Richmond				
Rockland	615	8,610	14	8,437
St. Lawrence	210	3,150	15	3,087
Saratoga	4,000	52,000	13	50,960
Schenectady	1,800	21,600	12	21,168
Schoharie	1,500	19,500	13	19,110
Schuyler	2,000	34,000	17	33,320
Seneca	600	9,200	15	9,016
Steuben	3,200	60,800	19	59,584
Suffolk	1,400	20,000	13	19,600
Sullivan	1,700	20,400	12	19,992
Tioga	1,061	21,220	20	20,795
Tompkins	700	14,000	20	13,720
Ulster	5,250	78,750	15	77,175
Warren	225	2,475	11	2,425
Washington	2,600	28,600	11	28,028
Wayne	1,800	36,000	20	35,280
Westchester	1,145	24,325	21	23,838
Wyoming	1,050	17,830	17	17,473
Yates	3,400	61,000	18	59,780
Total	104,912	1,537,427	14	\$1,506,673

County	OATS			Total Value
	Acres	Bushels	Av. Prod.	
Albany	19,750	434,500	22	\$173,800
Allegany	45,000	900,000	20	360,000
Broome	13,517	235,680	17	94,272
Cattaraugus	44,729	860,400	19	344,160
Cayuga	23,000	575,000	25	230,000
Chautauqua	28,450	585,000	20	234,000
Chemung	15,000	336,000	22	134,400
Chenango	15,400	323,690	21	129,476
Clinton	33,441	1,003,230	30	401,292
Columbia	15,700	423,900	27	169,560
Cortland	10,000	300,000	30	120,000
Delaware	14,500	348,000	24	139,200
Dutchess	18,500	481,000	26	192,400
Erie	33,000	825,000	25	330,000
Essex	9,000	252,000	28	100,800
Franklin	23,800	865,788	36	346,315
Fulton	8,000	224,000	28	89,600
Genesee	18,000	360,000	20	144,000
Greene	8,250	189,750	23	75,900
Hamilton				
Herkimer	8,000	346,000	43	138,400
Jefferson	78,000	2,044,000	26	817,600
Lewis	30,570	1,069,950	35	427,980
Livingston	93,755	812,650	8	325,060
Madison	18,000	450,000	25	180,000
Monroe	29,230	876,900	30	350,760
Montgomery	24,000	672,000	28	268,800
Nassau	475	9,500	20	3,800
Niagara	17,000	340,000	20	136,000
Oneida	29,000	900,800	31	360,320
Onondaga	30,000	750,000	25	300,000
Ontario	34,000	1,054,400	31	421,760
Orange	7,500	180,000	24	72,000
Orleans	12,000	220,000	18	88,000
Oswego	30,000	533,000	17	213,200
Otsego	24,850	646,100	26	258,440
Putnam	1,400	32,200	23	12,880
Queens				
Rensselaer	16,250	422,500	26	169,000
Richmond				
Rockland	975	26,325	27	10,530
St. Lawrence	75,000	1,800,400	24	720,160
Saratoga	20,000	580,000	29	232,000
Schenectady	7,450	216,050	29	86,420
Schoharie	17,000	425,000	25	170,000
Schuyler	14,000	302,000	21	120,800
Seneca	15,000	345,000	23	138,000
Steuben	53,000	1,060,000	20	424,000
Suffolk	2,500	72,000	24	28,800
Sullivan	8,000	192,000	24	76,800
Tioga	11,422	342,660	30	137,064
Tompkins	12,000	360,000	30	144,000
Ulster	10,100	232,300	23	92,920
Warren	2,000	52,000	26	20,800
Washington	20,750	477,250	23	190,900
Wayne	25,500	892,500	35	357,000
Westchester	769	23,460	30	9,384
Wyoming	28,509	455,600	16	182,240
Yates	15,950	499,400	31	199,760
Total	1,220,983	29,236,883	23	\$11,694,753

POTATOES

County	Acres	Bushels	Av. Prod.	Total Value
Albany	2,700	175,500	50	\$193,050
Allegany	10,500	913,500	87	1,004,850
Broome	8,352	676,086	80	743,694
Cattaraugus	4,100	235,000	57	258,500
Cayuga	3,500	350,000	100	385,000
Chautauqua	6,500	575,250	88	632,775
Chemung	4,000	250,000	62	275,000
Chenango	2,200	322,450	146	364,696
Clinton	7,680	1,152,000	150	1,267,200
Columbia	3,000	204,000	68	224,400
Cortland	3,928	412,500	105	453,750
Delaware	4,560	383,040	84	421,344
Dutchess	3,300	214,500	65	235,950
Erie	8,500	850,000	100	935,000
Essex	1,860	156,240	84	171,864
Franklin	8,000	1,125,000	140	1,237,500
Fulton	3,465	329,175	95	362,092
Genesee	9,500	315,000	33	346,500
Greene	1,900	152,000	80	197,200
Hamilton				
Herkimer	2,500	490,000	180	539,000
Jefferson	2,500	208,700	80	229,570
Lewis	2,750	261,250	95	287,375
Livingston	35,120	921,000	26	1,018,100
Madison	5,000	375,000	75	412,500
Monroe	16,146	807,300	50	888,030
Montgomery	2,000	170,000	85	197,000
Nassau	11,250	1,400,000	124	1,540,000
Niagara	2,700	135,000	50	148,500
Oneida	9,500	100,000	94	110,000
Onondaga	17,600	1,144,000	65	1,258,400
Ontario	13,000	900,000	69	990,000
Orange	4,620	360,360	78	396,396
Orleans	2,800	190,500	70	209,550
Oswego	6,000	250,000	41	275,000
Otsego	6,000	504,000	84	554,400
Putnam	575	43,125	75	47,437
Queens	662	45,000	69	49,500
Rensselaer	6,500	520,000	80	572,000
Richmond	12	512	42	563
Rockland	650	46,800	72	51,480
St. Lawrence	8,150	652,000	80	717,200
Saratoga	5,500	467,500	85	514,250
Schenectady	1,375	96,250	70	105,875
Schoharie	3,400	278,800	82	306,680
Schuyler	6,500	461,500	71	507,650
Seneca	1,500	150,000	100	165,000
Steuben	16,672	2,700,000	161	2,970,000
Suffolk	22,500	4,000,000	177	4,400,000
Sullivan	3,500	276,500	79	304,150
Tioga	5,400	540,000	100	594,000
Tompkins	4,180	459,800	110	505,780
Ulster	4,500	346,500	77	381,150
Warren	3,000	207,000	69	227,700
Washington	9,000	702,000	78	772,200
Wayne	10,000	500,000	50	550,000
Westchester	2,499	210,450	84	231,495
Wyoming	6,200	1,085,000	175	1,193,500
Yates	1,800	127,000	70	139,700
Total	361,106	30,924,088	85	\$34,016,495

BEANS				
<i>County</i>	<i>Acres</i>	<i>Bushels</i>	<i>Av. Prod.</i>	<i>Total Value</i>
Albany	200	2,400	12	\$13,200
Allegany	6,600	39,600	6	217,800
Broome	133	2,400	18	19,200
Cattaraugus	444	3,500	8	19,250
Cayuga	450	6,300	11	34,650
Chautauqua	350	2,750	8	15,125
Chemung	2,300	22,300	9	122,650
Chenango	266	3,125	11	17,187
Clinton	1,350	8,100	6	44,550
Columbia	75	750	10	4,125
Cortland	65	500	7	2,750
Delaware	100	1,000	10	5,500
Dutchess	75	1,050	14	5,775
Erie	2,500	35,000	14	192,500
Essex	400	3,200	8	17,600
Franklin	800	6,400	8	35,200
Fulton	150	1,500	10	8,250
Genesee	15,000	90,000	6	495,000
Greene	100	900	9	4,950
Hamilton				
Herkimer	60	300	5	1,650
Jefferson	1,500	33,060	22	181,830
Lewis	750	22,500	30	123,750
Livingston	50,560	426,720	7	2,346,960
Madison	1,000	8,000	8	44,000
Monroe	8,060	80,600	10	443,300
Montgomery	75	825	11	4,537
Nassau				
Niagara	650	5,850	9	32,175
Oneida	1,200	7,000	6	38,500
Onondaga	2,200	17,600	8	96,800
Ontario	14,700	147,000	10	808,500
Orange	50	500	10	2,750
Orleans	4,500	22,500	5	123,750
Oswego	800	8,500	10	46,750
Otsego	400	4,400	11	24,200
Putnam	35	350	10	1,925
Queens				
Rensselaer	125	1,625	13	8,937
Richmond	17	207	12	1,138
Rockland	50	500	10	2,750
St. Lawrence	400	2,400	6	13,200
Saratoga	600	6,000	10	33,000
Schenectady	80	880	11	4,840
Schoharie	250	3,500	14	19,250
Schuyler	8,000	88,000	11	484,000
Seneca	1,700	23,800	14	130,900
Steuben	5,340	96,120	18	528,660
Suffolk				
Sullivan	100	1,100	11	6,050
Tioga	488	7,320	15	40,260
Tompkins	1,557	23,345	15	128,397
Ulster	400	4,400	11	24,200
Warren	100	800	8	4,400
Washington	300	2,700	9	14,850
Wayne	15,500	310,000	20	1,705,000
Westchester	39	468	12	2,574
Wyoming	19,842	126,647	6	696,558
Yates	5,000	55,000	11	302,500
Total	177,786	1,771,292	9	\$9,742,103

CABBAGE

<i>County</i>	<i>Acres</i>	<i>Tons</i>	<i>Av. Prod.</i>	<i>Total Value</i>
Albany	200	2,600	13	\$78,000
Allegany	350	2,275	6	68,250
Broome	200	1,950	9	58,500
Cattaraugus	512	2,250	4	67,500
Cayuga	2,500	15,000	6	450,000
Chautauqua	325	1,230	4	36,900
Chemung	200	1,400	7	42,000
Chenango	772	14,240	18	427,200
Clinton	10	125	12	3,750
Columbia	751	7,500	10	225,000
Cortland	120	1,200	10	36,000
Delaware	70	560	8	16,800
Erie	715	7,150	10	214,500
Essex	10	100	10	3,000
Franklin	10	100	10	3,000
Fulton	400	6,400	16	192,000
Genesee	50	475	9	14,250
Greene	30	600	20	18,000
Hamilton	175	350	2	10,500
Herkimer	1,450	14,500	10	435,000
Jefferson	1,200	6,000	5	180,000
Lewis	3,920	27,440	7	823,200
Livingston	135	1,350	10	40,500
Madison	1,600	5,600	3.5	168,000
Monroe	1,828	14,624	8	438,720
Montgomery	600	5,000	8	150,000
Nassau	5,000	25,000	5	750,000
Niagara	3,500	18,500	5	555,000
Oneida	300	2,700	9	81,000
Onondaga	1,700	9,000	5	270,000
Ontario	750	15,000	20	450,000
Orange	100	850	8.5	25,500
Orleans	20	150	7	4,500
Oswego	169	591	3.5	17,730
Otsego	250	2,000	8	60,000
Putnam	46	690	15	20,700
Queens	200	1,800	9	54,000
Rensselaer	80	800	10	24,000
Richmond	125	1,250	10	37,500
Rockland	50	350	7	10,500
St. Lawrence	100	700	7	21,000
Saratoga	1,900	9,500	5	285,000
Schenectady	175	1,800	10	54,000
Schoharie	1,275	18,000	10	540,000
Schuyler	50	750	15	22,500
Seneca	440	3,960	9	118,800
Steuben	315	3,780	12	113,400
Suffolk	300	2,400	8	72,000
Sullivan	25	150	6	4,500
Tioga	120	1,200	10	36,000
Tompkins	2,400	43,625	19	1,308,750
Ulster	208	5,225	25	156,750
Warren	500	2,500	5	75,000
Washington	1,000	7,000	7	210,000
Wayne				
Westchester				
Wyoming				
Yates				
Total	39,231	319,290	8	\$9,578,700

ONIONS				
<i>County</i>	<i>Acres</i>	<i>Bushels</i>	<i>Av. Prod.</i>	<i>Total Value</i>
Albany	20	3, 500	175	\$0, 125
Allegany	50	2, 500	50	4, 375
Broome	3	500	166	875
Cattaraugus	200	35, 000	175	61, 250
Cayuga	30	1, 000	33	1, 750
Chautauqua	120	18, 225	151	31, 893
Chemung	4	400	100	700
Chenango	4	200	50	350
Clinton				
Columbia	16	4, 000	250	7, 000
Cortland				
Delaware	10	2, 000	200	3, 500
Dutchess	10	1, 800	180	3, 150
Erie	150	45, 000	300	78, 750
Essex				
Franklin				
Fulton	10	1, 600	160	2, 800
Genesee	455	113, 750	250	199, 062
Greene	20	5, 000	250	8, 750
Hamilton				
Herkimer	15	7, 500	500	13, 125
Jefferson				
Lewis				
Livingston	100	30, 260	300	52, 955
Madison	1, 100	220, 000	200	385, 000
Monroe	960	116, 264	121	203, 462
Montgomery	25	5, 625	225	9, 843
Nassau				
Niagara	417	47, 000	112	82, 250
Oneida	500	25, 000	50	43, 750
Onondaga	100	20, 000	200	35, 000
Ontario	7	1, 800	255	3, 150
Orange	3, 000	600, 000	200	1, 050, 000
Orleans	400	84, 000	210	147, 000
Oswego	250	125, 000	500	218, 750
Otsego	25	3, 000	140	5, 250
Putnam	5	500	100	875
Queens				
Rensselaer	20	4, 000	200	7, 000
Richmond	35	3, 500	100	6, 125
Rockland	20	3, 600	180	6, 300
St. Lawrence				
Saratoga	10	1, 800	180	3, 150
Schenectady	10	1, 800	180	3, 150
Schoharie	10	3, 500	350	6, 125
Schuyler	20	4, 000	200	7, 000
Seneca	186	5, 000	27	8, 750
Steuben	100	20, 000	200	35, 000
Suffolk				
Sullivan	10	2, 800	280	4, 900
Tioga	5	1, 250	250	2, 187
Tompkins	13	3, 370	259	5, 897
Ulster	25	5, 000	200	8, 750
Warren	10	2, 000	200	3, 500
Washington	35	4, 000	114	7, 000
Wayne	1, 600	240, 000	150	420, 000
Westchester	37	3, 250	88	5, 687
Wyoming	10	1, 200	120	2, 100
Yates	2	800	400	1, 400
Total	10, 164	1, 831, 294	180	\$3, 204, 761

HAY

County	Acres	Tons	Av. Prod.	Total Value
Albany	71,275	71,275	1.0	\$1,425,500
Allegany	119,380	89,535	.9	1,790,700
Broome	95,748	90,225	.9	1,804,500
Cattaraugus	95,895	112,060	1.0	2,253,200
Cayuga	70,000	70,000	1.0	1,400,000
Chautauqua	108,210	135,000	1.0	2,700,000
Chemung	45,000	38,000	.8	760,000
Chenango	145,000	108,700	.7	2,174,000
Clinton	78,358	58,269	.7	1,165,380
Columbia	75,000	67,500	.9	1,350,000
Cortland	50,000	56,250	1.0	1,125,000
Delaware	155,000	155,000	1.0	3,100,000
Dutchess	95,500	85,900	.9	1,718,000
Erie	67,000	101,000	1.0	2,020,000
Essex	46,850	42,165	.9	843,300
Franklin	94,000	65,191	.7	1,303,820
Fulton	30,780	30,780	1.0	615,600
Genesee	40,000	45,000	1.0	900,000
Greene	58,500	58,500	1.0	1,170,000
Hamilton .....	.....	.....	.....	.....
Herkimer	75,000	73,000	.9	1,460,000
Jefferson	200,000	132,090	.6	2,641,800
Lewis	148,775	133,875	.9	2,677,500
Livingston	60,004	82,654	1.3	1,653,080
Madison	70,200	105,300	1.5	2,106,000
Monroe	40,000	52,980	1.3	1,059,600
Montgomery	81,000	72,900	.9	1,458,000
Nassau	800	950	1.0	19,000
Niagara	80,000	84,000	1.0	1,680,000
Oneida	155,000	125,000	.8	2,500,000
Onondaga	112,400	168,600	1.5	3,372,000
Ontario	69,000	60,000	.8	1,200,000
Orange	85,800	85,800	1.0	1,716,000
Orleans	36,000	36,000	1.0	720,000
Oswego	64,000	70,300	1.0	1,406,000
Otsego	147,500	147,500	1.0	2,950,000
Putnam	17,750	17,750	1.0	355,000
Queens .....	.....	.....	.....	.....
Rensselaer	71,300	64,170	.9	1,283,400
Richmond .....	.....	.....	.....	.....
Rockland	6,400	6,400	1.0	128,000
St. Lawrence	154,948	108,460	.7	2,169,200
Saratoga	65,400	57,600	.9	1,152,000
Schenectady	28,500	28,500	1.0	570,000
Schoharie	84,000	84,000	1.0	1,680,000
Schuyler	45,207	34,000	.7	680,000
Seneca	28,000	21,000	.7	420,000
Steuben	202,500	128,800	.6	2,576,000
Suffolk	8,000	10,000	1.2	200,000
Sullivan	74,700	74,700	1.0	1,494,000
Tioga	39,467	35,500	.9	710,000
Tompkins	62,000	60,000	.9	1,260,000
Ulster	77,500	77,500	1.0	1,550,000
Warren	30,000	27,000	.9	540,000
Washington	118,000	94,400	.8	1,888,000
Wayne	56,000	28,500	.5	570,000
Westchester	17,698	36,450	2.0	729,000
Wyoming	63,250	105,900	1.5	2,118,000
Yates	40,000	30,000	.7	600,000
Total	4,257,595	4,042,529	.9	\$80,850,580

DEPARTMENT OF FARMS AND MARKETS

<i>County</i>	APPLES		PEARS	
	<i>Bushels</i>	<i>Value</i>	<i>Bushels</i>	<i>Value</i>
Albany	78,125	\$117,187	12,000	\$36,000
Allegany	15,000	22,500	3,500	10,500
Broome .....	.....	.....	1,200	3,600
Cattaraugus	15,000	22,500	1,500	4,500
Cayuga	32,000	48,000	12,400	37,200
Chautauqua	12,250	18,375	1,750	5,250
Chemung	38,000	57,000	7,600	22,800
Chenango	500	750	1,650	4,950
Clinton	15,000	22,500	.....	.....
Columbia	125,000	187,500	60,000	180,000
Cortland .....	.....	.....	500	1,500
Delaware	18,750	28,125	700	2,100
Dutchess	136,720	205,080	20,000	60,000
Erie	25,000	37,500	17,600	52,800
Essex	34,000	51,000	450	1,350
Franklin	6,000	9,000	.....	.....
Fulton	5,650	8,475	62	186
Genesee	80,000	120,000	8,750	26,250
Greene	156,250	234,375	50,000	150,000
Hamilton .....	.....	.....	.....	.....
Herkimer	68,000	102,000	.....	.....
Jefferson .....	.....	.....	.....	.....
Lewis	750	1,125	.....	.....
Livingston	29,000	43,500	.....	.....
Madison	8,000	12,000	.....	.....
Monroe	1,682,000	2,523,000	405,120	1,215,360
Montgomery	43,750	65,625	1,094	3,282
Nassau	1,400	2,100	.....	.....
Niagara	650,000	975,000	54,000	162,000
Oneida	100,000	150,000	.....	.....
Onondaga	75,000	112,500	60	180
Ontario	115,000	172,500	22,000	66,000
Orange	150,000	225,000	35,000	105,000
Orleans	320,000	480,000	70,000	210,000
Oswego	437,333	655,999	200,000	600,000
Otsego	100,000	150,000	3,200	9,600
Putnam	25,000	37,500	600	1,800
Queens .....	.....	.....	.....	.....
Rensselaer	25,000	37,500	20,000	60,000
Richmond .....	.....	.....	.....	.....
Rockland	34,375	51,562	4,000	12,000
St. Lawrence .....	.....	.....	.....	.....
Saratoga	42,180	63,270	600	1,800
Schenectady	20,300	30,450	1,500	4,500
Schoharie	56,250	84,375	4,800	14,400
Schuyler	80,000	120,000	6,720	20,160
Seneca	62,500	93,750	26,000	78,000
Steuben	11,332	16,998	5,794	17,382
Suffolk	15,000	22,500	6,000	18,000
Sullivan	31,500	47,250	3,800	11,400
Tioga	35,000	52,500	748	2,244
Tompkins	40,000	60,000	5,000	15,000
Ulster	212,500	318,750	75,000	225,000
Warren	5,000	7,500	.....	.....
Washington	15,600	23,400	1,000	3,000
Wayne	1,500,000	2,250,000	100,000	300,000
Westchester	45,500	68,250	5,200	15,600
Wyoming	55,748	83,622	5,000	15,000
Yates	87,500	131,250	12,500	37,500
Total	6,973,763	\$10,460,643	1,274,398	\$3,823,194

<i>County</i>	PEACHES		GRAPES	
	<i>Bushels</i>	<i>Value</i>	<i>Tons</i>	<i>Value</i>
Albany	3, 800	\$9, 500	10	\$1, 400
Allegany				
Broome			2	280
Cattaraugus	81	202	928	129, 920
Cayuga	1, 000	2, 500	25	3, 500
Chautauqua	350	875	15, 250	2, 135, 000
Chemung	1, 000	2, 500		
Chenango				
Clinton				
Columbia	8, 000	20, 000	1, 200	168, 000
Cortland			2	280
Delaware			6	840
Dutchess	25, 000	62, 500	255	35, 700
Erie			2, 800	392, 000
Essex				
Franklin				
Fulton				
Genesee			170	23, 800
Greene	7, 000	17, 500	36	5, 040
Hamilton				
Herkimer				
Jefferson				
Lewis				
Livingston				
Madison				
Monroe	225, 876	564, 690	200	28, 000
Montgomery				
Nassau				
Niagara	360, 000	900, 000	750	105, 000
Oneida				
Onondaga			50	7, 000
Ontario	1, 250	3, 125	400	56, 000
Orange	24, 000	60, 000	625	87, 500
Orleans	310, 000	775, 000	1, 250	175, 000
Oswego				
Otsego			5	700
Putnam	2, 100	5, 250	5	700
Queens				
Rensselaer			10	1, 400
Richmond				
Rockland	9, 000	22, 500	25	3, 500
St. Lawrence				
Saratoga				
Schenectady				
Schoharie	1, 800	4, 500	8	1, 120
Schuyler	2, 800	7, 000	2, 000	280, 000
Seneca	13, 500	33, 750	1, 500	210, 000
Steuben	1, 000	2, 500	2, 700	378, 000
Suffolk	1, 200	3, 000		
Sullivan	200	500	5	700
Tioga	150	375	1	140
Tompkins	1, 050	2, 625	30	4, 200
Ulster	42, 000	105, 000	4, 500	630, 000
Warren				
Washington				
Wayne	135, 000	337, 500	195	27, 300
Westchester	22, 500	56, 250	975	136, 500
Wyoming	246	615	14	1, 960
Yates	2, 000	5, 000	7, 000	980, 000
Total	1, 201, 903	\$3, 004, 757	42, 932	\$6, 010, 480

TOTAL VALUE OF ALL COMMODITIES BY COUNTIES

<i>County</i>	<i>Total value of all commodities</i>
Albany	\$2,605,267
Allegany	3,852,231
Broome	2,897,448
Cattaraugus	3,293,879
Cayuga	3,316,705
Chautauqua	6,162,164
Chemung	1,771,630
Chenango	3,251,869
Clinton	3,098,977
Columbia	3,010,452
Cortland	2,075,765
Delaware	3,939,129
Dutchess	3,218,953
Erie	5,334,957
Essex	1,295,566
Franklin	3,635,535
Fulton	1,217,170
Genesee	3,658,662
Greene	2,211,784
Hamilton .....	.....
Herkimer	2,378,525
Jefferson	3,960,011
Lewis	3,666,136
Livingston	8,082,117
Madison	3,564,498
Monroe	11,013,528
Montgomery	2,283,169
Nassau	1,869,155
Niagara	5,547,010
Oneida	3,567,233
Onondaga	6,707,625
Ontario	5,716,419
Orange	4,287,668
Orleans	3,848,870
Oswego	4,155,094
Otsego	4,338,199
Putnam	529,052
Queens	67,230
Rensselaer	2,735,487
Richmond	28,724
Rockland	420,013
St. Lawrence	4,103,817
Saratoga	2,496,661
Schenectady	1,002,058
Schoharie	2,709,899
Schuyler	2,661,217
Seneca	2,267,283
Steuben	7,852,758
Suffolk	5,840,325
Sullivan	2,182,373
Tioga	1,981,157
Tompkins	2,716,225
Ulster	3,988,676
Warren	902,529
Washington	3,413,555
Wayne	9,003,930
Westchester	1,525,491
Wyoming	5,063,516
Yates	3,354,970
Total	<u>\$201,680,347</u>

REPORT OF STATISTICS RELATIVE TO THE DAIRY INDUSTRY IN
NEW YORK STATE

	1919	1920
Number of plants reporting.....	1,434	1,536
Number of dairies supplying milk.....	84,843	86,675
Number of cows.....	1,172,727	1,242,168
Milk received during year (pounds).....	15,360,568,948	5,083,182,441
Cream received during year (pounds).....		35,380,967
Milk sold for human consumption (pounds)	2,405,649,249	2,598,101,189
Cream sold for human consumption (pounds)	39,588,695	47,984,354

MANUFACTURED PRODUCTS

	Pounds	Pounds
Creamery butter.....	14,069,268	18,241,729
Whey butter	733,070	881,108
American cheese (whole milk).....	62,568,829	51,952,096
American cheese (part skim and whole skim)	3,126,731	2,764,856
Swiss cheese	1,733,384	2,133,734
Brick and Munster cheese.....	2,119,122	2,291,094
Limburger cheese	4,473,824	4,014,259
Cottage, pot, bakers and hoop cheese.....	12,242,493	12,483,335
Cream and Neufchatel cheese.....	2,625,217	3,251,711
Italian cheese	2,950,313	5,646,253
All other cheese.....	2,696,229	4,439,513
Sweetened condensed milk (case goods):		
unskimmed	406,480,647	249,930,772
skimmed	2,131,343	2,947,656
Sweetened condensed milk (bulk goods):		
unskimmed	16,656,718	28,722,245
skimmed	1,065,672	8,173,561
Unsweetened evaporated milk (case goods):		
unskimmed	52,647,938	75,339,420
skimmed	68,388	233,300
Unsweetened evaporated milk (bulk goods):		
unskimmed	11,626,084	18,562,050
skimmed	3,419,411	6,235,233
Evaporated skimmed milk (modified with foreign fat)	880,000	493,816
Sterilized milk	1,588,327	3,645,616
Powdered whole milk.....	4,130,413	5,009,492
Powdered cream	535,349	305,358
Powdered skimmed milk.....	14,863,277	19,497,302
Malted milk	86,202	398,981
Ice cream	(gals.) 12,436,807	15,188,000
Casein (dried)	2,874,825	1,325,529
Milk sugar	703,255	977,126

¹ Includes cream.² Includes 81,646 pounds whole skim cheese.³ Includes 15,758,146 pounds unsweetened condensed unskimmed milk.⁴ Includes 2,340,367 pounds unsweetened condensed skimmed milk.

VALUE OF DAIRY PRODUCTS

	1919	1920
Whole milk	\$134,268,795.24	\$120,842,011.10
Cream	10,951,318.19	15,115,071.51
Butter (creamery and whey)	9,012,231.20	11,645,192.18
American cheese (whole milk)	21,671,328.60	13,882,100.05
American cheese (part skim and full skim)	684,811.92	414,728.40
Swiss cheese	780,022.80	806,551.45
Brick and Munster cheese	847,648.80	916,437.60
Limburger cheese	1,565,838.50	1,361,435.44
Cottage, pot, bakers and hoop cheese	1,836,373.95	1,498,321.20
Cream and Neufchatel cheese	787,565.10	975,513.30
Italian cheese	1,475,156.50	2,351,426.28
All other varieties of cheese	1,348,114.50	2,308,596.76
Condensed milk (all kinds)	86,848,816.64	56,185,476.96
Evaporated milk (all kinds)	9,232,411.32	10,226,900.09
Evaporated milk modified with foreign fat		41,136.00
Powdered whole milk	1,780,212.32	2,249,148.01
Powdered cream	381,703.84	234,820.31
Powdered skimmed milk	3,582,049.73	4,230,914.54
Malted milk		125,679.02
Ice cream	18,655,210.50	22,872,000.00
Casein	574,965.00	278,361.09
Milk sugar	189,878.85	263,823.02
Total	<u>\$306,492,452.50</u>	<u>\$268,825,647.29</u>

COMPARISON OF PRICES

	1913	1918	1919	1920	
Milk	\$1.55	\$3.00	\$3.57	\$3.52	per hundred pounds.
Butter .....	.2868	.5150	.6072	.6144	per lb.
Cheese .....	.145	.255	.3266	.2672	per lb.

PERCENTAGE OF MILK USED IN DAIRY PRODUCTS

	Pounds	Pounds of milk used	Per cent of total 1920	Per cent of total 1919
Milk for human consumption	2,598,101,189	2,598,101,189	48.60	44.84
Condensed and evaporated milk (all kinds)	394,283,669	897,481,245	16.61	22.11
Cheese (all kinds)	88,976,851	732,706,192	13.68	15.21
Cream shipped	47,984,358	363,181,393	6.78	5.97
Butter (creamery and whey)	19,722,837	362,834,580	6.75	5.24
Ice cream	15,188,000 gals.	227,820,000	4.21	3.48
Powdered and malted milk	5,713,831	49,374,944	.89	.65
Loss			2.50	2.50

AMOUNT OF MILK USED IN EACH MANUFACTURED PRODUCT—1920

	<i>Pounds</i>
Cream	363,181,393
Creamery butter	362,834,580
American cheese (whole milk)	519,520,960
American cheese (part and full skim)	18,694,680
Swiss cheese	23,471,074
Brick and Munster cheese	20,619,846
Limburger cheese	36,118,331
Cream and Neufchatel cheese	22,761,977
Italian cheese	45,170,024
All other cheese	44,395,120
Condensed milk (all kinds)	696,632,542
Evaporated milk (all kinds)	197,193,087
Sterilized milk	3,645,616
Powdered whole milk	40,075,936
Powdered cream	6,107,160
Malted milk	3,191,848
Ice cream	227,820,000
Loss (estimated)	65,760,855
Total	<u>2,696,195,039</u>

RELATIVE PRODUCTION OF DAIRY PRODUCTS IN UNITED STATES
AND NEW YORK STATE

CREAMERY BUTTER

	<i>1919</i>	<i>1920</i>
United States	868,478,370 lbs.	835,605,866 lbs.
New York State	14,069,268 lbs.	18,241,729 lbs.
Percentage manufactured in New York State	1.52	2.18
Rank of New York State	<u>16</u>	<u>13</u>

CHEESE—ALL KINDS

United States	411,169,948 lbs.	372,107,895 lbs.
New York State	91,585,829 lbs.	88,976,851 lbs.
Percentage manufactured in New York State	22.27	23.92
Rank of New York State	<u>2</u>	<u>2</u>

CONDENSED AND EVAPORATED MILK—ALL KINDS

United States	2,173,303,568 lbs.	1,650,388,252 lbs.
New York State	494,656,941 lbs.	394,283,669 lbs.
Percentage manufactured in New York State	22.76	24.46
Rank of New York State	<u>2</u>	<u>2</u>

DEPARTMENT OF FARMS AND MARKETS

POWDERED MILK, CREAM, AND SKIMMED MILK

United States	44,594,842 lbs.	51,139,440 lbs.
New York State.....	19,529,039 lbs.	24,812,152 lbs.
Percentage manufactured in New York State	43.79	48.52
Rank of New York State.....	1	1

TOTAL NUMBER OF FARMS AND NUMBER OF DAIRY FARMS IN NEW YORK

(Figures taken from U. S. Census)

	1910	1920
Total number of farms.....	215,597	193,062
Number of farms reporting dairy cattle.....	185,664	162,367

DAIRY COWS ON FARMS IN NEW YORK STATE

(Figures taken from U. S. Census)

	Number
June 1, 1850, milch cows	931,324
June 1, 1860, milch cows	1,123,634
June 1, 1870, milch cows	1,350,661
June 1, 1880, milch cows	1,437,855
June 1, 1890, milch cows	1,440,230
June 1, 1900, cows kept for milk, 2 years or older.....	1,501,608
*April 15, 1910.....	1,343,000
January 1, 1920.....	1,481,918

* The number of dairy cows two years old is not given in the census of 1910; but the number of cows and heifers 15½ months old or older is given, and the number of heifers 3¼ to 15½ months old. From these facts the number of cows two years old or older was estimated at the figure given here.

BRANCH OFFICES

The following reports show the work done through the branch offices of the Division of Agriculture, located in New York City, Buffalo, Rochester, Utica, and Cortland, under the direction of the Commissioner.

The enforcement of the agricultural law is accomplished through branch offices of the Division, to which agents are assigned who obtain samples for testing, and who make inspections and otherwise carry out the provisions of the statute.

NEW YORK CITY OFFICE

New York City has the purest and most wholesome milk supply of any city in the world, and a great part of the work of the inspectors in the New York office is the inspection of milk to determine whether it complies with the standard provided by law. While thousands of inspections of milk and cream were made in 1921, it was found necessary to submit only 279 samples of milk; and 149 samples of cream to the Chemist for analysis. This shows that adulteration is slight and that the general trend is complete observance of the law with regard to the standards on milk and cream in the New York City district. Special attention was given during the year to the investigation of mixing plants, where imitation cream was being produced. This was done with particular reference to sour cream. It was found that certain plants were mixing skim milk and cream and placing the product on the market as sour cream. The facts in these cases were submitted to the Commissioner and the necessary action taken. Inspections were made for the purpose of ascertaining whether skim milk and cocoanut oil were being mixed and placed upon the market as milk or cream. The following samples were submitted for analysis by the Chemist as the result of inspections made by agents in the New York City district: 279 samples of milk; 149 samples of cream; 195 samples of feeding stuffs; 168 samples of fertilizers; 50 samples of agricultural seeds; 46 samples of evaporated milk; 35 samples of condensed milk; 27 samples of turpentine; 22 samples of linseed oil; 15 samples of oleomargarine; 11 samples of cheese; 3 herd samples; 2 samples of evaporated apples; 1 sample of milk and cream; 1 "Hebe" sample; 1 sample of super-cream.

The following table shows the total receipts of milk, condensed milk, and of cream in New York City for the year 1921:

RECEIPTS IN NEW YORK CITY

	1921	1920
Total cans crude milk.....	25,730,620	24,395,061
Total cans cream and condensed milk.....	1,380,201	1,269,609
Daily average cans crude milk.....	70,496	66,653
Daily average cans cream and condensed milk.....	3,781	3,469
Average price, per can grade B milk.....	<u>\$2.57</u>	<u>\$3.0275</u>

ANIMAL INDUSTRY WORK

Under assignments from the Bureau of Animal Industry during the year 1921, veterinarians assigned to the New York office tested 77 herds for tuberculosis, performed 250 post-mortems, and tested 1,761 cattle for tuberculosis.

Other work done in the New York City District follows:

Number of calves and carcasses of calves seized in violation of the bob veal law, 462; number of hog cholera investigations, 13; number of hogs inoculated against disease, 300; number of cases investigated for outbreak of rabies, 9; number of horses tested for glanders, 74.

In addition to this, 92 special investigations were made by veterinarians and agents in connection with the work of the bureau.

FARM SETTLEMENT WORK

During the year, 1,475 farm labor applicants called at the New York City office, asking to be sent as farm laborers throughout the State. Many of these were inexperienced in farm work of any kind, but were seeking work. In all, 573 laborers and 8 farmerettes were sent to various farms as general farm workers, tractor operators, truckmen, gardeners, fruit packers and pickers. Of this number, 340 were inexperienced and 233 were skilled in farm work. In co-operation with county agricultural agents, work was obtained for 185 inexperienced men for the summer months. Reports have been received from 85 sent out by this office for farm work and these show that 39 were placed permanently on farms. The average compensation per month was \$32, with board and room. This office has kept in touch with national centers in various parts of the city; and by means of lectures, books, and the distribution of farm bulletins, has advised many who have recently come to our shores of the advantages of farming in New York State. Through the efforts of this office, foreign periodicals published here have been an important factor in this work. In connection with the Americanization work which the state and federal governments conduct it has been possible, through special permission, to provide lectures concerning the opportunities for settlement in the rural districts of the state. A number of farms within the New York City District were sold through this office, largely to immigrants, and reports show that the purchasers had been successful in their farming work.

A number of complaints have been received, especially from foreigners, stating that they have been victims of farm brokers who sold them worthless farms, in many instances extracting from them \$2,000 to \$3,000. The complaints state that the purchasers found that the property was without value and were forced to re-sell to the same brokers for less than 10 per cent of the price paid originally.

BUFFALO OFFICE

In the Buffalo district the work of the Division is carried on through nine agents, including the Agent-in-Charge. During 1921, 5,657 places were visited in the inspection of milk and cream and 21,313 samples examined. In this inspection 584 were taken for analysis. Agents visited 96 stores in the enforcement of the milk container law and 1,646 places were visited in oleomargarine and butter substitute inspection. Fourteen samples were taken for analysis. Agents also visited 185 milk plants in carrying out the provisions of Section 35-a relative to satisfactory tests of milk where the Babcock method was used as a basis for payment. The object of this is to protect producers with regard to tests. The reports for the Buffalo District also shows a large number of inspections on feeds, fertilizers, and seeds.

Agents in the Buffalo district also assisted in tuberculosis eradication work, and in enforcement of the dog licensing and bob veal laws.

ROCHESTER OFFICE

In the Division of Agriculture of the Rochester Office there are six agents, including the Agent-in-Charge.

In the year 1921, 110 samples of milk were taken by the agents in the enforcement of the law relative to butter-fat content. The number of herd samples were 76. Milk in the hands of 299 peddlers was inspected and milk cans and bottles were examined. Babcock tests of milk to the number of 1,224 were made and 19 tests of cream. The number of Babcock tests checked up at milk stations in order to assure producers of a correct test where payment is on the basis of the test was 75. Twenty examinations for those desiring licenses to test milk by the Babcock method were held. Agents in this district inspected 137 restaurants in oleomargarine and milk work. Inspections and investigations relative to cattle shipments numbered 126, and in addition to this assistance was given on cattle appraisals. Other inspections with regard to beef cattle, hogs, lambs, and veal were made.

UTICA OFFICE

In the Utica Office of the Department nine agents, including the Agent-in-Charge, are engaged in the enforcement of the Agricultural Law. In 1921 agents of the Division made inspections at 898 factories, creameries, condensaries, and milk stations, including sanitary inspections and investigations for license under Section 45 and at 326 plants where the Babcock tests were made.

The number of samples of milk or cream tested by the Babcock method during the year by agents in this district was 4,925. The milk of 25,973 patrons was inspected by the lactometer test for the purpose of determining whether it met with the requirements of the law. Agents visited 247 hotels, restaurants, or stores to make inspections with regard to the sale of milk, oleomargarine, or butter substitutes. They visited 543 stores to make inspections with regard to feeding stuffs, fertilizer, and seed. Examinations were given during 1921 for those desiring to test milk and cream by the Babcock method to the number of 27, and 120 candidates were examined. Many samples of milk, feed, fertilizers, and seeds were taken for analysis. Agents also made 283 investigations relative to diseases of cattle, disinfection of stables, appraisal of condemned animals, and quarantine enforcement.

CORTLAND OFFICE

In the Cortland Office of the Division of Agriculture are six agents, including the Agent-in-Charge, who enforce the provisions of the Agricultural Law under the direction of the Commissioner of Agriculture. Functions performed by these agents include to a large extent the inspection of milk and dairy products, tuberculosis work, and other duties carried on through assignment by the Bureau of Animal Industry.

In the year 1921 many inspections of milk were made by the agents to determine whether it complied with the standards provided by the law. Investigations were made at 198 milk stations for the purpose of insuring accurate tests under the Babcock method to the end that correct tests be given producers where payment was on a butter-fat basis. The 1921 report for the Cortland District shows that milk delivered to 15,147 patrons was inspected and that 431 samples of milk were inspected while in the hands of peddlers, and that 263 milk stores, restaurants, lunch rooms, and hotels were visited for the inspection of milk sold at these places. Agents visited 165 restaurants, lunch rooms, and hotels for the enforcement of the law relative to the sale of oleomargarine. The report shows a considerable amount of other inspection work done by agents in this district.

VETERINARY SERVICE

Assistance was given by representatives in this district in tuberculosis test and physical examination of cattle. Many investigations were made with regard to the enforcement of the law on bob veal. Glanders investigations were conducted, rabies outbreaks handled, and dog quarantines supervised.

DIVISION OF FOODS AND MARKETS

DIVISION OF FOODS AND MARKETS

Work of the Division of Foods and Markets was carried on during the year through the same six bureaus that comprised the organization last year as follows:

- Bureau of Markets and Storage.
- Bureau of Cooperative Associations.
- Bureau of Food Products.
- Bureau of Food Standardization.
- Bureau of Weights and Measures.
- Bureau of Licenses.
- Branch offices: New York and Buffalo.

Probably the most noteworthy feature of the year's activities was the evidence of the growing recognition on the part of leaders in agriculture, farmers and business men as well, of the importance of marketing, or distribution of farm products. For less than a decade has this problem of distribution received adequate attention and the scope of the economic field presented by this phase of the agricultural industry is tremendous, including the factors of grading and standardization, the financing of crop movements, transportation, storage warehouse facilities and eventual delivery to retailers and consumers with a minimum of friction, the utmost efficiency and economy of effort and expense. The significance of the present day movement among farmers for better marketing facilities and methods cannot but impress even the more casual student of American agriculture and commerce.

Most important in its relation to the above problem and beneficial to the consumer as well as the producer is the cooperative movement which has made such strides throughout this country within recent years. Not only does the success of cooperative marketing imply improved quality through the grading and standardization of the particular commodity handled but the consumer also benefits through the stabilization of the supply and reduction of waste and the elimination of any unnecessary links in the chain of distribution.

Growth of the cooperative marketing movement among New York State producers continued during the year, the establishment of nine state-wide marketing associations dealing in eight separate farm-produced commodities being a forward step in the history of cooperation in New York State. These are:

- Western N. Y. Cooperative Packing House Assn., Inc.
- C. & E. Grape Growers Cooperative Assn., Inc.
- New York State Wool Growers Cooperative Assn., Inc.
- Empire State Potato Growers Cooperative Assn., Inc.
- New York State Seed Potato Cooperative Assn., Inc.
- Maple Producers Cooperative Assn., Inc.

Empire State Federation of Beekeepers Cooperative Assn.,
Inc.

New York State Canning Crops Growers Cooperative Assn.,
Inc.

Dairymen's League Cooperative Assn., Inc.

Also, a cooperative purchasing association.

At the close of the year there were in existence more than 1,200 local cooperative marketing associations, two-thirds of which were affiliated with the centralized state groups mentioned, these 1,200 locals dealing in more than twenty different farm products. The volume of business handled by all of these cooperative organizations for this year is conservatively estimated from their annual reports at hand to be in the neighborhood of \$80,000,000. More detailed information as to the status of the cooperative movement and the State's program in relation thereto will be found in the accompanying report of the Bureau of Cooperative Associations.

Progress in grading and standardization activities was an important item in the work of the Division of Foods and Markets for the year 1921, these two essential factors in improved marketing being projected for the first time on a state-wide basis for potatoes and onions. The grading demonstrations of the potatoes were carried on among groups of potato producers selling through the central association and also among producers marketing their crop through produce dealers and shippers. The United States standard grades were used for potatoes, the effect of which was helpful in the sale of interstate shipments by New York potato growers as well as aiding the producer to become familiar with the grading requirements established for this particular crop. Attention is called to the report of the Bureau of Markets and Storage which had charge of this activity.

Development of the market news service was carried on extensively through the year and this work is covered elsewhere in this report. In October the printed weekly market report was discontinued at the instance of the Board of Estimate and Control because of the considerable expense of printing and postage amounting to approximately \$25,000 a year. As an alternative, the Department established contracts with the Associated Press, United Press and International News Service to the end that these great news gathering associations agreed to take the New York market news gathered by the New York office and send same to practically every daily newspaper in New York State without charge, this factor being well under way with the close of the year.

At the request of automobile associations, the checking up of gasoline delivery devices was carried on by the Bureau of Weights and Measures together with other work, while during the year the Bureau of Food Products and the Bureau of Food Standardization made progress in their respective lines of effort. With the prospect of a general tie-up along all lines of railroad transportation, the Division was able to offer to Federal and State

agencies complete information as to the quantity of foodstuffs on hand and source of supply available, this data being later taken over by the Port of New York authorities.

The motion picture "Behind the Breakfast Table," which gives an interesting picture of the food distribution methods in New York City, had been seen by at least half a million persons by the end of 1921. Three prints were made of this film. The Board of Education of New York City borrowed one print of the film for almost the entire year and then decided to have a special copy made at its own expense for permanent use in the New York City public schools. After all requests for the film from theatres, farm bureaus and other places within New York State had been filled the film was sent to those who requested it outside the State. Included in the places outside of New York State at which the film was shown were the following: Newark public schools (one month); Cleveland public schools (two weeks); a circuit of community organizations in Michigan (two weeks); California, Indiana, Washington, D. C., New Jersey (farmers' meetings), Porto Rico and Connecticut.

During the last half of the year, the Legislative Committee on Reorganization of the Department held several sessions at which the directors of the Division made suggestions and proposed amendments which were found to be of value to the committee in this work.

BUREAU OF MARKETS AND STORAGE

Activities carried on by the bureau fall naturally into two main divisions, those pertaining to the enforcement of the cold storage law and those pertaining to the various aspects of marketing. For convenience in treatment this classification of the work is observed in the detailed report which follows:

MARKETING ACTIVITIES

MARKET NEWS SERVICE

The chief events in connection with the market news service during the year were: first, the discontinuance of the printed weekly market report covering the New York market because of its cost and, secondly, the effecting of arrangements with various press associations whereby daily morning and afternoon market news stories are sent out by wire from New York City and thereby made available to all the more important newspapers of the state. Lastly, there was also established in May a new service covering feed prices in the Buffalo market which is sent by mail to a limited list and is also given to the press associations for sending by wire to the newspapers.

Suspension of the weekly printed report issued from the New York office was brought about as the result of the retrenchment program recommended by the Governor's efficiency committee. The development of the outlet for market news through the newspapers by means of the wire service mentioned above has offset to some extent the loss of the weekly printed report. This wire service to the newspapers has the great merit of speed in getting the information where it is needed and giving it a wide circulation, but the reports which are sent out must of necessity be greatly condensed and, because of this, such service can never quite achieve some of the advantages of the more detailed printed report.

In addition to the special reports mentioned above the following mimeographed market reports have been sent out by mail during the year from the New York office: (1) A brief daily summary of conditions in the New York market and other important terminal markets outside the state mailed to all the daily papers in the state and to every weekly newspaper on the day nearest to the day the paper goes to press; (2) the regular daily market report covering in detail the chief New York state commodities in the New York City market, which is mailed on request to any person needing such daily report who is not adequately served by the newspaper reports; (3) a special daily report on sales of near-by country produce in the farmers' public markets in New York City, which is sent to a mailing list, mainly on Long Island, and is also published in the Brooklyn Times.

From the Buffalo office, in addition to the special report on feed prices mentioned above, there has also been issued throughout the year the usual mimeographed report covering conditions and prices in the local Buffalo markets for fruits, vegetables, dairy products, eggs, and miscellaneous commodities. This report has been furnished the newspapers located in the Buffalo territory and has also been sent out to a mailing list of farmers and shippers. From both the Buffalo office and the New York office the practice of sending market information by telegraph collect to any person or firm requesting such special service has been continued.

COOPERATION WITH U. S. BUREAU

During the year, as the result of conferences with representatives of the U. S. Bureau of Markets, there was effected a close working arrangement with the latter bureau, whereby all the market information collected by the federal agency by its leased-wire system covering all the important terminal markets

of the country is made available to our New York office for distribution through the state market news service. In this manner the scope and value of the state service has been greatly increased, and it has been possible from time to time to furnish special service covering the whole country for the benefit of New York state shippers.

SPECIAL GRAPE REPORT

An example of the possibilities of cooperation with the U. S. Bureau of Markets, as described above, is found in the special grape report prepared in the New York office during the past season, giving car arrivals, prices, and market conditions in the New York, Pittsburg, Philadelphia, and Chicago markets. This was sent out by wire and mailed to all important grape regions of the state and was also furnished to the central office of the State Federation of Farm Bureaus for mailing to their various connections.

MARKET NEWS BY WIRELESS

The bureau during the year has kept in close touch with the experiments of the U. S. Bureau of Markets in the dissemination of market information by radio telegraph and radio phone as well as with the development of this type of service in certain states which have taken it up as a definite marketing project. A considerable amount of study has been given to the technical and practical aspects of such service for New York State as a basis for future development when the time seems propitious for such a service, and negotiations are pending with Cornell University and with Union College and the General Electric Company for an experimental trial of the service in the near future.

The only actual operations attempted along this line by the bureau during the year were conducted as part of the exhibit at the state fair in September. At this time arrangements were made with a commercial wireless company to transmit from New York City a special market report covering a few selected commodities. This was received each day during the fair by means of a receiving set located in the exhibit booth of the bureau and attracted a great deal of attention from those attending the fair. The object of the demonstration was twofold: First to try out the feasibility of such a method of transmitting market news; and, secondly, to stimulate interest among farmers and shippers in the possibilities of such a service in New York State.

COMPLAINT AND GRIEVANCE SERVICE

The usual number of complaints and grievances against transportation companies and wholesale dealers on the part of farmers and shippers were received and investigated during the year. The total number of such communications reaching the Albany office was twenty-two and in nature they ranged from requests for assistance in preparing or investigating claims against transportation companies for lost or damaged shipments to requests for inspection of rejected shipments and claims of failure to make proper money returns on the part of wholesale dealers. Two complaints of the latter sort were against dealers located outside the state and were satisfactorily settled through the assistance of other state market bureaus. Twelve of the other complaints were investigated through the New York office and three were referred to the Buffalo office.

STANDARDIZATION AND GRADING

Adoption and use of recognized grades is held by all students of the marketing problem to be fundamental to any program of marketing reform in the handling of agricultural products. The plans of the Bureau of Markets and Storage at the beginning of the year therefore called for the drawing up and adoption of official New York grades for various commodi-

ties, and the demonstration by agents of the bureau at shipping points of the proper use of such grades. It was also hoped to devise some form of shipping point certification similar to that used in Wisconsin and other states but modified to suit New York conditions.

The development of this program by the bureau during the past year has been made difficult, because of lack of a sufficient number of men to do the necessary field work. The program also received a most serious set-back as the result of a decision by the Counsel of the Department that the Commissioner did not have the power to establish official state grades and promulgate rules for the enforcement of the same. In spite of these difficulties, however, it is felt that some real progress has been made during the year which will bear fruit later in the development of better grading of New York State products.

Potato Grades.—During the early part of the year final hearings were held on the potato grades and rules pertaining to the same which had been proposed by the bureau for adoption as the official standard for New York State. The result of the hearings was entirely favorable to the grades and rules as drawn, but the decision of the Counsel of the Department prevented their final approval by the Commissioner and necessitated an entire change in the plans of the bureau in this matter of improving the grading of New York State products.

The potato grades as proposed provided the same specifications as the unofficial grades recommended by the U. S. Bureau of Markets—practically the same grades as were used during the period of the Food Administration. Accordingly a cooperative arrangement was entered into with the U. S. Bureau of Markets whereby two inspectors from the state bureau were placed under the direction of a representative of the federal bureau for the purpose of demonstrating the proper use of the U. S. potato grades at the various loading stations in the state. During the progress of this work nearly all the important potato shipping points were visited and demonstrations of the grades given for the benefit of cooperative associations, dealers, and many farmer-shippers.

Onion Grades.—Grades and rules for the marketing of onions similar to those for potatoes were proposed by the bureau during the early part of the year and arrangements were made to hold state-wide hearings on the same. These hearings of necessity were cancelled when the decision noted above concerning the potato grades was received. Little progress therefore has been made during the year in carrying out the program of the bureau in respect to onion grades.

On a special request from the County Farm Bureau Manager, however, considerable attention was given to the onion situation in Orange County and an attempt to interest the shippers in better grading was made by means of a series of meetings and conferences. The lack of any official state grade proved a serious handicap and little progress was made. It was disclosed, however, that certain sharp practices and fraud seem to be peculiarly prevalent in the Orange County onion deal and plans have been made to cooperate with the Orange County Farm Bureau next season in an effort to prevent the same through recourse to that portion of the agricultural law relating to adulteration and misbranding.

PUBLIC MARKET

Considerable additions were made during the year to the general information which the bureau has been collecting in regard to the operation and management of public or farmers' markets, both in New York State and in other states. In addition, both the director and assistant director addressed a number of meetings and conferences in various cities where the question of local markets of this sort was being agitated.

Albany Market.—A special investigation of the Albany public farmers' market was conducted during the year, part of the work being done by the assistant director at odd times, and part being accomplished by an intensive

study extending over a period of a week at the height of the season, during which time either the assistant director or an inspector assigned temporarily for this work, or both, were on the market all the time while selling was taking place. During this particular week careful records were kept of all products received on the market and special attention was paid to the extent of the wholesale selling to dealers who haul away their purchases by truck to towns and cities outside the Albany district.

The data gathered as the result of this study of the Albany Market have been summarized in a special report in which are included recommendations as to the improvement of the market. These data prove a valuable addition to the information of the bureau concerning public markets in general and furnish the basis for making definite improvements in the local market which it is hoped may be worked out during the coming year.

Watervliet Market.—The farmers' market located at Watervliet was deemed worthy of special study during the year; first, because it marks a new departure in the operation of a market controlled and owned cooperatively by farmers, and, secondly, because its history is bound up with an older municipal market in the city of Troy from which the farmers withdrew because of oppressive city regulations and restrictions. One other end in view in making the detailed study of this market was to suggest improvements which would place it on a sounder basis and possibly increase its volume of business to a more profitable figure.

The careful analysis made of the difficulties encountered by the farmers in Troy before they withdrew from the latter city to form their own market brought out a number of points in the management of a municipal market which are of general interest to all cities. The study of the Watervliet Market itself brought out certain possibilities for its improvement and disclosed some of the peculiar difficulties connected with the operation of a cooperatively owned farmers' market which may prevent the making of similar errors when the plan is tried elsewhere.

SPECIAL STUDY OF FRUIT STORAGES

Because of the growing demand on the part of farmers and shippers for dependable information regarding the costs of construction, mechanical equipment, methods of operation, and advantages of small cold storage warehouses located at country points, the bureau began during the latter part of May a detailed study of certain existing storages of this type. This work was interrupted from time to time because of the pressure of other work but has now been completed. Definite cost figures have been secured for a total of 20 warehouses, the ratio between costs and available storage space has been determined in each case; and, in general, the layout of the various plants, their methods of operation, and the nature and volume of business have been analyzed in such manner as to bring out the more important factors in the success or failure of the different plants. The information thus made available has already proved of value in advising and assisting other communities which contemplate putting up local cold storage plants.

MISCELLANEOUS STUDIES AND INVESTIGATIONS

In addition to the special studies and investigations already mentioned, the following studies were either continued from the previous year or were inaugurated as new projects:

- (1) Addition of data concerning shipments on the barge canal and Hudson River to the material gathered last year as part of the state-wide shipping point survey, and the indexing and analysis of the major portion of this material so as to make the same readily available as an aid to various phases of the work of the bureau.

- (2) Collection of information concerning the number, capacity, location, and ownership of all dry storage warehouses used for agricultural products in the state. This information is estimated to be now about 90 per cent. complete for these types of storages located outside of New York City.

(3) Special study of the business of a milk distributor located in Troy who was falling behind in his payments to farmers. A careful cost study of the business was made by the assistant director of the bureau and as the result of his recommendations changes in methods were made which placed the business on a sound and profitable basis, enabling payment of the amounts due the farmers for milk sold.

(4) An emergency survey of food stocks in the cold storage warehouses and dry storages of the state made at the request of the governor in connection with the situation resulting from the threatened railroad strike in October. For a short period all the forces of the bureau were concentrated on the gathering and tabulating of these data and the results gave a fairly accurate estimate of the available food stocks on hand at country points, together with the location of the same in respect to the Barge Canal and Hudson River as well as the holdings in cold storage in the cities.

TRANSPORTATION MATTERS

Beginning with the month of September the work in connection with transportation formerly carried on by the Bureau of Markets and Storage was taken over by the newly organized Bureau of Traffic and Transportation. The more important matters handled during the year prior to this transfer of work were briefly as follows:

(1) Assistance rendered the State Farm Bureau Federation in arranging a conference with the traffic chiefs of the various railroads in the state relative to a reduction in the rates on agricultural lime, resulting in a substantial readjustment of the rates and the establishing of a contact which paved the way for a further presentation of the matter later in the year by the new Traffic Bureau.

(2) During the month of April prompt action by the bureau in presenting the case to the Rate Division of the American Railway Express Company resulted in the cancellation of a proposed change in tariff which would have withdrawn the existing commodity rate on eggs from Phelps Junction and adjacent points to New York City. This cancellation meant the saving of a very considerable sum for the egg shippers at these points.

COLD STORAGE ENFORCEMENT

The work of the bureau in enforcing the cold storage law has been greatly increased during the year by the passage of certain amendments to the law which extended its scope to cover a large number of storage places not previously under its provisions. These changes in the law not only increased the inspection work to be done by the bureau but also necessitated the revision of many of the report forms used, as well as a redrafting of the rules and regulations supplementary to the law.

The addition of two new inspectors to the staff of the bureau and the installation of a new system of visible record keeping which greatly expedites the handling of violation cases have aided the work materially during the year.

INSPECTIONS AND VIOLATIONS

The inspection work of the bureau involves three phases: (1) Routine inspections of warehouses licensed under the law; (2) special inspections of warehouses which have made application for licenses, or of warehouses which it is thought should be required to take out licenses; (3) inspections of wholesale and retail stores selling cold storage food. Evidence of apparent violations of the law secured by the agents of the bureau during the course of these various inspections is submitted to the bureau in the form of special reports. These reports, when such evidence seems sufficient, are transmitted through the Counsel of the Department to the Attorney General as a basis for prosecution.

The details concerning these various aspects of the work during the year are set forth in the tables which follow:

TABLE I

INCREASE IN NUMBER OF WAREHOUSES

Total number of licensed warehouses Jan. 1, 1921.....	84
Total number of licensed warehouses Jan. 1, 1922.....	113
Net gain during year.....	29

TABLE II

WAREHOUSE INSPECTIONS

Routine inspections of licensed warehouses.....	2,912
Special inspections of un-licensed warehouses.....	196
Total warehouse inspections.....	3,108
Nature and number of alleged violations reported :	
Storage over 12 months.....	173
Violation of temporary storage permit.....	3
Omission of cold storage marks.....	11
Illegal transfer.....	1
Re-storage after removal of sale.....	2
Use of improper stamp.....	1
Failure to notify owner of overtime goods.....	7
Unfit food in storage.....	5
Operating without a license.....	2
Report of holdings not rendered.....	1
Failure to notify buyer of previous storage.....	1
Total alleged violations.....	207

TABLE III

INSPECTIONS OF WHOLESALE AND RETAIL STORES

Number of places inspected.....	1,097
Nature and number of alleged violations reported :	
Food not properly represented as cold storage.....	21
Refusal of access to records.....	2
Total alleged violations.....	23

TABLE IV

DISPOSITION OF VIOLATION REPORTS

Discontinued by the bureau after investigation.....	2
Cases submitted to Counsel of Department.....	228
Under investigation at close of year.....	(None)
Cases returned by Counsel with advice to discontinue.....	45

TABLE V

Total of all inspections made.....	4,205
Total violation cases handled.....	230
Penalties collected by Attorney-General.....	\$3,225
Unwholesome foods condemned and destroyed, lbs.....	75,000

SALE OF COLD STORAGE FOOD

The enforcement work in connection with the sale of cold storage food has been expanded during the year in comparison with previous years. The extent of this work is shown above in Table III. This is in line with the program laid down two years ago which called for the securing of certain changes in the law which would put the warehouse inspection work on a better basis and also make the enforcement of the sales provisions more feasible than they were in the older law. A campaign of education among warehousemen and wholesale dealers during the year, it is felt, has now placed the bureau in position to bring about a strict enforcement of the law in retail stores during the coming year. As a part of this campaign of education conferences were held with the wholesale dealers in New York City, Buffalo, Rochester, Syracuse, Utica, and Albany. For two weeks during

December, also, all inspectors were withdrawn from warehouse work and concentrated their activities in the cities mentioned above in checking up the handling of cold storage food by wholesalers and in submitting evidence of misrepresentation of such food by these dealers. Just prior to the Thanksgiving period the inspectors concentrated their work on the sale of turkeys which had been in cold storage and in this connection submitted a number of violation cases against retail dealers.

COOPERATION WITH U. S. BUREAU OF CHEMISTRY

During the year contact was established with the U. S. Bureau of Chemistry with a view to checking evasions of the New York law through shipment of unmarked cold storage food from outside the state. As the result of this cooperation, work was carried on in Buffalo and in New York City aimed at especially flagrant violations of this sort and fair results were achieved in checking the traffic. In the case of New York City the cooperation of the New Jersey Department of Health was also secured.

LEGISLATION

The drafting of amendments to the cold storage law entailed a considerable amount of work for the Director of the bureau and the chief Cold Storage Inspector during the early part of the year. This work involved numerous conferences with the trade, cold storage experts, warehousemen and the legislative committee to which the proposed amendments were submitted. The result, however, was to give New York State what has been characterized in many quarters as "a model cold storage law."

A considerable amount of time has also been spent during the year in connection with federal cold storage legislation now pending at Washington in an effort to secure a law not too seriously in conflict with the provisions of our state law.

BUREAU OF COOPERATIVE ASSOCIATIONS

It is of interest, after the developments in the field of cooperation in this state during the year 1921, to look back to its status in the year 1917 when this bureau was created, and to one of the policies on which its work has been based. In a fairly accurate survey it was found that there were at that time approximately eighteen incorporated cooperative associations alive and being conducted on basic cooperative principles. There were besides a number of community cooperative projects, loose pseudo-cooperatives, and also a number of so-called cooperative creameries, that had lived through all these years since an organization wave created them some thirty years ago.

The one outstanding association was the Dairymen's League, which was attempting to grow into a real cooperative marketing organization.

A policy adopted by the bureau at the time of its institution was to create genuine cooperative associations, incorporated under one of the cooperative acts on the statute books of this state in communities where real problems could be solved by such an association and where there was a chance for real success. Such organizations, it was believed, were necessary and undoubtedly the best means of bringing the cooperative idea forcibly before the minds of New York State farmers, teaching them the fundamentals of organization and of carrying on such projects, and preparing them for the big state-wide movements which were bound to follow.

It would seem that the wisdom of this policy has been proved by the events of 1921. During that period four state-wide associations were launched, their birth and chances of success made possible because of this Bureau's pioneer work. In regard to one state-wide association, although launched a year ago, the plan was revised and its real development has taken place this year. Other state-wide associations that had taken out their charters the previous year saw then greatest development. The Dairymen's League Cooperative Association has come into its own as a real cooperative marketing agency, the closing months of the year bringing a wave of confidence in this organization. The year closed with the following state-wide cooperative marketing associations in the field:

Fruit.—Western New York Cooperative Packing House Association, Inc.

Grapes.—C. & E. Grape Growers Cooperative Association, Inc.

Wool.—New York State Wool Growers Cooperative Association, Inc.

Potatoes.—Empire State Potato Growers Cooperative Association, Inc.,
New York State Seed Potato Cooperative Association, Inc.

Maple Products.—Maple Producers Cooperative Association, Inc.

Honey.—New York Honey Producers Cooperative Association, Inc.

Canning Crops.—New York State Canning Crops Growers Cooperative Association, Inc.

Dairy.—Dairymen's League Cooperative Association, Inc.

There was also organized a cooperative purchasing association.—The Cooperative Grange League Federation Exchange, Inc., which purchases supplies and distributes them to its members through many local cooperative associations and personal representatives.

During the years preceding the latter part of 1920, in which this bureau has been an active and important factor in the development of cooperative marketing in New York State, it was possible to develop a definite program of organization work with sound underlying policies, giving every association thus created a chance for success.

Interest was good among producers and consumers, although not so great but that very careful consideration was given by them to the matters pertaining to successful organization. Thus it was possible for the personnel of this bureau, through meetings and follow-up work in all of these communities, to have a marked influence on this early organization work—a vital point in that these organizations were to lead the way for many that

would follow. Successes were achieved, enthusiastic cooperators sprung up all over the state, many agencies threw their weight behind the idea of cooperative marketing; and so, during the first six months of 1921 the bureau faced an entirely new problem.

It was not selling the idea of cooperative marketing, of creating new organizations, *but of keeping the trend of cooperative organization in the proper channels.* Organization had reached such a pitch of enthusiasm that it was physically impossible for the personnel of the bureau to meet all of the demands made by interested groups throughout the state. This resulted in many uncompleted local organizations, many that were groping about for proper methods.

Facing these conditions the primary policy for this bureau during the latter part of the year was one of active follow-up work, a personal visitation to assist the associations in completing their organizations and working out safe and sound policies. Meanwhile, the state-wide associations were calling for constant assistance from the director and his force, in the development of plans and policies on which these would be able to build to success. The records of the bureau show that at the close of 1921 there were 1191 incorporated cooperative associations in the state, representing twenty-seven different lines of activity, ten organized on a state-wide basis.

A total of 187 new associations were organized during the year, 51 more than were organized during 1920.

These cover 21 different lines of activities represented as follows:

Among Producers:

Fruit	13
Wool	3
Canning crops	33
Cheese	11
Honey	9
Grapes	5
Strawberries	1
Maple	3
Live stock	1
Tuberculosis eradication	1
Potatoes	18
Vegetables	5
Asparagus	1
Dairy	8
Seed Corn	1
General marketing and purchasing	21
Purchasing supplies	46

Among Consumers:

Recreational	1
Store (General)	4
Butcher shop	1
Cooperative apartment house	1

Field work by organizers included: 312 general meetings; 352 conference meetings; 112 special follow-up meetings; 56 special investigations; 43 examinations of accounts of associations; 41 accounting systems installed. This does not include the many conference meetings held by the organizer at the New York office or those held at the Albany office. The director addressed 65 general meetings not listed above and was in conference many times with respect to the larger developments.

The following lines of activities and organization work being conducted by the bureau are mostly continuations of those of the preceding year. You will note that the commodity organization plan is being followed closely and that in many cases the point has been reached where a central organization has been created, thus enhancing the chances for success of that particular movement.

Fruit.—Stimulated by the success obtained by the cooperative packing house associations in the western fruit belt and their central sales associations in marketing their 1920 fruit crop, several more local organizations in that

belt were created during the year. Grading, standardization, and packing were perfected this year, sales by the central association being conducted on a pooling basis.

Initial local organizations have been established in the Hudson Valley. Working with a committee organized by the Farm Bureau, a plan was evolved on which to base further development, looking forward to a central sales association.

Wool.—Three county sheep growers' associations have been organized, bringing the total to thirty-six, all members of the central sales association. More local associations joined in the 1921 pool than in 1920. A new departure was made in that the association had some of its products manufactured into bed blankets, horse blankets, automobile robes, and men's suits. This proved a successful venture.

Canning Crops.—A reorganization of the New York State Canning Crop Growers' Association was brought about. A paid secretary and manager were engaged. Thirty-three local associations were organized. A strong growers' contract was adopted. A campaign to sign up all the members to this contract was started by the association during the late fall.

Cheese.—Conditions in the market for dairy products during the last year have been directly responsible for the interest shown by producers living in districts remote from the markets, or without good marketing facilities, in cooperative marketing to help solve their problems. Because of the conditions incident to their location, cheese seems to be the best form in which to sell their milk. Eleven cooperative cheese factory organizations have started business this year. Seven are in St. Lawrence county and are now selling through a central agency. Close cooperation was experienced between the bureau and the Farm Bureau Manager of St. Lawrence county in bringing about these organizations.

Honey.—At the end of 1920 twelve county associations and a state association had been organized among the honey producers. It was hoped that the state association would take hold of the situation and assist in organizing the counties in which honey was produced to any extent. This did not prove the case, the directors having failed to practice that which they had organized for. However, the different county associations of beekeepers were very much in earnest, calling on the bureau for assistance with the result that ten additional associations were organized, bringing the total to twenty-two.

The State Association was reorganized at the fall meeting, when a definite development plan was adopted which will lead to a central sales organization being created this winter and in shape to market cooperatively their product in 1922.

Grapes.—As stated in our 1920 report, the Grape Growers' organization in the Chautauqua belt was very successful. Five more local associations have been organized this year. The growers in the Pennsylvania end of this belt, with the assistance of their state bureau of markets, have recently reorganized a successful organization under the membership plan, which will also become a member of the central sales association.

Requests were received during December for assistance in further organization work in the Keuka grape belt.

Maple Products.—Two more local associations of maple sap producers were organized this spring, making a total of twenty-two local associations in the state. Last winter a committee of representative producers—all members of a local association—was formed to study and bring about a central sales association. Several meetings were held at which the Vermont producers were also represented. The Federation of Farm Bureaus was very active in connection with this project and saw to it that advertising and merchandising specialists were present, besides state marketing representatives. However, a satisfactory plan that could be put over in the short time intervening before the 1921 season came on, was not developed. Nevertheless, the experience gained by the local associations helped the producers to realize the advantages of a central sales association with a definite marketing program.

During October the committee, through the efforts of the Farm Bureau Federation, engaged Messrs. Langner and Sapiro to promote the state-wide sales association. The Maple Producers Cooperative Association was incorporated, and a campaign manager engaged. They will endeavor to sign up 200,000 gallons of syrup to market in 1922.

Live Stock.—Most of our live stock associations have to do with the breeding of pure-bred animals, but one association this year was organized to ship calves, hogs, and surplus beef animals for its members, a pioneer in this state in this activity. The prime mover of this organization in the community was a farmer who had recently moved in from one of the western states.

Potatoes.—The work accomplished by this bureau in the organization of the potato and cabbage growers in Central New York last year centered the attention of the Marketing Committee of the Farm Bureau Federation on the possibilities of a state sales association. A state potato committee was organized. Assisted by experts from the college and this bureau a thorough study of the situation was made. The result was the organization and incorporation of the Empire State Potato Growers Cooperative Association. Operations were started, handling the crops of its member associations, October first, and had proved successful to the close of the year.

Seventeen local associations were organized during the year, making a total of 43 ready to become members of the state association.

Vegetables.—The associations that have been created among the vegetable growers this year are for the purpose of more economically marketing the products of their members. These are shipping associations that take the place of the local dealer. Grading and standardization is practiced, most of the associations using a trade mark.

Asparagus.—This association was recently organized and is making its plans to handle the 1922 crop.

Strawberries.—This is the first organization in the state devoted exclusively to marketing this crop, and is located at New Haven.

Dairy.—The eight associations listed under dairy were organized by the producers in their respective communities for varied purposes. Some are protective in nature, purchasing small plants and equipment to meet any emergencies in the milk market which would make it necessary for them to make up their milk; others are manufacturing and selling to distributors; and still others are making direct distribution to the consumers of their community.

Seed Corn.—This association is interested in growing and marketing a good silage corn that has been developed in the community.

Purchasing Supplies.—The creation and operation of the Grange League Federation Exchange has stimulated the organization of local associations in the farming communities for the purchase of supplies. Forty-six have been organized primarily for that purpose during the period covered by this report. Some of the associations have purchased warehouses and are conducting a large volume of business, while others are merely buying carload lots.

Twenty-one associations have been organized which are general in nature, doing a general marketing and purchasing business.

Accredited Herd.—On the last day of the year The Otsego Accredited Herd Cooperative Association was incorporated. Its purpose is to cooperate with the federal and state departments in the eradication of tuberculosis from all the herds of Otsego County.

Poultry and Eggs.—Although no marketing associations were organized, the bureau, working in conjunction with the Ulster County Farm Bureau and a poultry association of producers, instituted a survey of the industry in Ulster County to ascertain the feasibility of organizing a successful association there.

Recreational.—A large proportion of the work of this bureau in connection with consumers has been done with organized labor groups. The Rochester division of the Amalgamated Clothing Workers of America wrote the

Division this spring for assistance in establishing a cooperative Summer Resort Club. The director gave this matter his personal attention and brought about a cooperative organization incorporated under Article 21 of the Membership Corporations laws. The purpose of the organization is to conduct a summer vacation resort for its members.

Stores.—Four cooperative stores have been organized, the most promising one being at Groton, N. Y. The whole force of the Corona Typewriter Works from office to boiler room are back of the movement. Our latest information is that the store is succeeding beyond expectation.

Butcher Shop.—The Bureau has given assistance a number of times to groups of Hebrews interested in establishing Kosher markets. The cooperative way seems to be a successful way. This butcher shop is located at Binghamton, N. Y.

Apartment House.—This association organized in New York City was developed on the cooperative housing plan recommended by the bureau, and was the direct result of the work of Organizer Blatchley of the New York office.

OTHER LINES OF ACTIVITY

In addition to this organization and follow-up work there were several other lines of activity followed by the bureau.

The investigation of firms purporting to be cooperative and using the term in their name to mislead caused about seventy investigations to be made. The Cooperative Society of America, a large national spurious cooperative in particular was investigated, following which recommendations were made to the Attorney-General, proceedings being instituted by that department. Many firms discontinued the use of the word "cooperative" on being shown that it was illegal; others needed persuasion. Many firms or corporations, acting in good faith and incorporated prior to the enactment of Article 3, were not pressed after full letters of explanation and in some cases briefs were submitted.

The survey of consumers' cooperative associations began in 1920. One hundred nineteen associations were visited by representatives of the Bureau. A tabulation of this survey has now been completed and an article is being prepared for publication which should be a real contribution to cooperation. The purpose of the survey was to go further than the collection of merely statistical data. An attempt has been made to ascertain the various methods of management and other elements affecting the success or failure of the societies. Such factors are then outlined as a guide to further cooperative organization.

A particularly good piece of work was accomplished in bringing about a federation of the consumers' cooperative associations in New York City. This body is actively interested in all matters pertaining to cooperation.

The accountant has proved to be a valuable addition to our bureau force. Many demands have been made for assistance from the many associations, in perfecting or installing complete systems of accounting. Much trouble had been experienced in getting the associations to report properly and promptly as required by law. The fact that they have to report has an important bearing on the movement in this state. The accountant has taken full charge of this work with the result that reports are coming in as never before. Every report is passed on by him and if not correct in any detail is mailed back for correction.

EXHIBIT AT THE STATE FAIR

The contribution of the Bureau to the exhibit of the department at the State Fair was an effort to show not only the value of cooperative marketing but its growth in this state since the Bureau was created, and to display the graded and standardized commodities marketed by the many cooperative organizations. The finest cooperation was shown by the organizations that were called upon to furnish a sample of the commodity in which they

were interested. Woolen blankets, from the wool growers' association, teasels, seed corn, seed potatoes, table stock potatoes from the Empire State Association, maple products, grapes, fruit, hay, dairy products, tobacco, and other products were on display. That it was successful in bringing to the attention of both producers and consumers the value of cooperative marketing is evidenced by the many interested visitors to the exhibit and by the correspondence received at the Albany office.

The outstanding features for the year affecting the bureau have been the large number of associations coming into existence and the development of central sales associations. As the movement grows it brings more work on the bureau, and there are times when it is impossible to work with all the associations desiring help. Although a year of general business depression, we believe that cooperative marketing is more safely intrenched in New York State than ever before.

BUREAU OF WEIGHTS AND MEASURES

The routine work of the bureau was finished on schedule time and a good conception of its volume and importance can be gained by referring to the tables on file in the Bureau.

Section 11, Article 2, of the General Business Law requires that all cities and counties shall be visited at least once in two years in order to inspect the work of the local sealer in the performance of his duties, and accordingly the year 1921 was devoted to the checking up of the volume and quality of work done by the county sealers. The compilations show that an average of 86.7% of the weighing and measuring devices used for commercial purposes in the counties were found to be correct.

The annual inspection of state institutions as required by law discloses that the weighing and measuring devices used in the state hospitals were 93.6% correct. In the state prisons the devices were found to be 89.2%. The charitable institutions of the state were using devices which were found to be 80% correct.

During 1921 thirty-one cases were found where the facts seemed to warrant prosecution and accordingly thirty-one cases were transmitted to the Legal Bureau for such attention and action as this Bureau should deem the facts warranted.

In addition to the routine work, the special investigations made consumed fully 50% of the time and energy of this Bureau. Furthermore, this special work is of greater importance in many instances than the regular inspectional functions of the Bureau. Therefore, it is considered expedient to outline briefly this phase of weights and measures work.

1: A number of complaints were received regarding alleged irregularities in connection with milk receiving stations, and during the year special investigations were conducted at milk receiving stations located at the following places: Massena Springs, Smyrna, Fort Ann, Edwards, Franklinville, Arcade, Cherususco, Roscoe, Erin, and Chepachet.

In addition to these investigations a general survey was made of all the milk receiving stations in Jefferson County for the purpose of determining the weights and measures methods and practices of milk receiving stations. Much valuable information was gained and the knowledge thus derived has facilitated our investigations of milk receiving stations.

2: The city and county sealers often find it necessary to call on this Bureau for assistance. The necessity for assistance is obvious when consideration is given to the fact that the local inspectors are oftentimes very well known, which makes it impossible for them to secure evidence, especially in the nature of decoy purchases. Assistance of importance was given to the local sealers in the following places: Kingston, Elmira, Poughkeepsie, Rochester, Hudson, Amsterdam, Binghamton; also in Otsego, Schuyler, Delaware, Tioga, Jefferson, and Tompkins counties.

In many of these cases evidence was secured which enabled the local weights and measures official to successfully prosecute the offenders.

3: A survey was made to determine the methods of weighing and selling bread. Practically every city of importance in the state was visited and investigations made. Approximately 2,000 loaves were inspected and re-weighed. Of the wrapped loaves bearing net weight notations only 15% were found to be correct as to weight. A great amount of other valuable data pertaining to bread was obtained.

4: The railroad track scales in this state are an important factor in the transportation and sale of a great many of our products. Therefore, a special inspection was made through the aid and cooperation of the United States Bureau of Standards who furnished the test cars necessary. Inspections were made in 30 cities and villages and a total of 60 track scales was inspected. Twenty-nine of the 60 scales inspected were found to be correct. The 31

incorrect scales were either condemned for repairs or condemned for replacement.

5: Special investigations were made concerning the methods and practices used in the sale of coal at the following places: Albany, West Point, Greenport and Schenectady.

6: Gasoline dispensing devices in use in this state have been the cause of some complaint and have required more special attention during 1921 than any other weighing or measuring devices. Therefore, during the last week in September and the first two weeks in October, a survey of gasoline dispensers was conducted. This investigation was accomplished by equipping two automobiles belonging to the department with gasoline tanks having false compartments into which the operator put the decoy purchase of gasoline, and in turn, the inspectors measured the decoy purchases thus made. In this manner they ascertained whether or not accurate measure was given. Seventy-eight cities and villages were visited and 100 purchases were made. Twenty-three were found to deliver correct measure; 32 delivered over measure, and 45 delivered short measure. Of the 45 short deliveries made 22 were short enough to warrant prosecution.

7: Three weights and measures exhibits were made during the year, two being in New York City and one at the State Fair. The objects of these exhibits are to educate the public to the need of more care being exercised when purchases are made.

8: Several important conferences and meetings were attended by the Director and weights and measures talks given in each instance, which is all a part of the educational program of the Bureau. The annual conference of the Sealers of Weights and Measures of the State of New York was held in the Education Building in Albany during March, 1921. This conference allows the city and county Sealers of Weights and Measures an opportunity to express themselves regarding weights and measures problems. It also serves the purpose of a class assembled for instruction.

9: The Bureau conducted some interesting experimental work and tests on loadometers being used by the State Highway Department. These devices are used for the purpose of ascertaining the weight of automobile trucks which use our state highways.

10: The laboratory work of the Bureau is of great importance due to the fact that no weighing or measuring device can be offered for sale or used in the state of New York without first being approved by this Bureau. This work is of a highly technical nature and cannot be explained without going into lengthy detailed explanations. However, a complete record of this phase of the Bureau's work is kept on file at this office.

In addition to the above work seventeen minor special investigations were conducted.

BUREAU OF FOOD PRODUCTS

Activities of the Bureau of Food Products have to do with the enforcement of the law against the adulteration and misbranding of food products and require the making of inspections of retail stores, vinegar plants, food manufacturing, restaurants, and other places where food is prepared or sold. These inspections include the taking of samples for laboratory tests, the making of cases for violations of the law and reporting same, and the informing of manufacturers and retailers as to the rules and regulations concerning the food products handled.

During the year 1921 there were 12,885 stores inspected by the agents of this bureau; 1,997 food samples were taken for analysis. There were prepared 587 cases of violations, which have been submitted to the Counsel, resulting either in compliance with the law or in prosecution of the case by the Attorney-General. Of this number, 175 cases have been settled, the penalties recovered amounting to \$5,186.87. About 200 samples of cold storage eggs were taken and cases prepared for Counsel during the year.

Vinegar factories have been inspected, and samples of their output, together with skins and cores, have been taken and sent in for analysis. Tests for acidity of miscellaneous samples of vinegar sent in by individual farmers, etc., have been made and reported upon.

Among the inspections conducted by this bureau, in cooperation with the Bureau of Food Standardization, the following deal with the more important food commodities: apple butter, hamburger steak, sausage, sweet pickles (bulk and bottled), malt extracts, vinegar, maple sugar, maple syrup, honey, honey compounds, table oil, peanut butter, soft drinks and other beverages, and the labeling of various dried fruits. Especial attention has been paid to the collection and analysis of compressed yeast, gelatin, sausage, egg substitutes, honey and honey compounds, soft fruit drinks, and baking powder, and many violations have been found.

Agents have been paying special attention to soft drinks sold, especially those advertised to contain fruits; they have been instructed to pay particular attention to compressed yeast, gelatin, and hamburger steak found on the market, as this Bureau holds that many of these commodities are being misbranded under the definitions adopted by the Council of Farms and Markets.

During the year 42 cases of Mazo and Eg-No, also 33 cases of Allenegg — all substitute cases — have been settled and affidavits filed stating that the manufacture of this product has been discontinued. In cases of egg substitutes, the manufacturers declared in their affidavits that they not only had ceased manufacturing same but were calling all of their stock in whenever possible and would discontinue its manufacture.

The attention of the bureau has been called to several brands of alleged olive oil in New York City, and the subject is still under investigation.

Among matters in which the Bureau has been able to render effective cooperation with Federal authorities are a number of cases of alleged violations in regard to egg noodles, vinegar, soft drinks, granulated sugar, and sauerkraut.

BUREAU OF FOOD STANDARDIZATION

The work of the Bureau of Food Standardization for the year 1921 included an unusual amount of research work on methods of analysis. On a number of subjects taken up for investigation during the year methods of analysis were either defective or unsatisfactory. This was found to be the case especially in the examination of jellies, malt extracts, ice cream, sausage, and honey. During the year, assistance and advice has been given to the State Industrial Commission and to the Purchasing Committee for State Institutions under the State Fiscal Supervisor. At the request of Assemblyman Miller specifications for motor gasoline were supplied him for the purpose of incorporating into a bill to regulate the sale of this material. The following are the more important subjects that have been under investigation during the year with the number of samples of each commodity taken:

Commodity	Samples taken
Apple butter	64
Baking powder	222
Beverages (soft drinks)	132
Egg substitutes	31
Honey	93
Ice cream	59
Jellies and jams	234
Malt extracts	37
Prepared mustards	65
Sweet pickles	80
Pork sausage	75
Salad dressings	102
Yeast	17

Samples.—The total number of samples received for examination during the year was 2,816. This material has also been tabulated showing, for each month, of what the samples consisted. The tabulation also shows the amount of any single kind of material received during the year. In the subsequent parts of the report many of the individual subjects are taken up separately and tables giving the chemical work are included.

DIVISION OF AGRICULTURE

The laboratory received for examination for the Commissioner of Agriculture during the year, 1,190 samples, a considerable increase over previous years in the work sent to the laboratory by the Commissioner. This will be seen by reference to the following table, which shows the amount of work for the years 1918, 1919, 1920, with that for the year 1921. The work for the year 1918 includes, with the work at the Albany laboratory, all work done in the laboratories in New York City and at Buffalo.

	1918	1919	1920	1921
Oleomargarine and butter	116	88	123	39
Cheese	5	24	13	16
Cream	66	7	115	237
Cream condensed			1	2
Hydrometers				5
Lactometers	36	49	47	48
Linseed oil, boiled	58	12	7	11
Linseed oil, raw		19	30	6
Milk and skim milk	400	438	412	693
Milk condensed	64	34	44	110
Thermometers				5
Turpentine	60	31	65	18
Total	805	702	857	1,190

The laboratory received 690 samples of milk, and 3 samples of skim milk, during the year 1921. The percentage of original samples (which are samples taken for violation of law) above standard is 27.13 for 1921. In 1920 the percentage was 30.41 and in 1919, 30.47. The laboratory received 54 sam-

ples of evaporated or unsweetened condensed milk and 3 samples of evaporated cream. Included in the tabulation of unsweetened condensed milk are nine samples of the condensed skim milk coconut fat mixtures, namely, four of Hebe, two of Enzo, one each of Carolene, Nu-Ko, and K-O. Of the unsweetened condensed milks, three were under the legal standard of 25.5 per cent of total solids and three were under legal standard of 7.8 per cent of fat. The tabulation shows the results of the examination of forty-six samples of sweetened condensed milk. Of these, four were under the legal standard of 28 per cent of total milk solids, and 11 were under the legal standard of 8 per cent of fat.

Included in the 237 samples of cream were 25 samples of milk and cream, which are tabulated separately. Of the remaining 212 samples of cream 157 samples, over 74 per cent, were sour. The sour and curdled condition of these creams and the desire of the Commissioner that the fat be examined to determine whether or not the fat was all milk fat have required a large amount of additional work on the part of the chemists. In only one case has the fat been found to be other than milk fat. Tabulation showing the results obtained on all samples of cream is on file. The tabulations also show the results obtained in the examination of cheese, oleomargarine and butter, linseed oil, raw and boiled, and turpentine.

DIVISION OF FOODS AND MARKETS

BAKING POWDER

The definition accepted by the Council of Farms and Markets and also by the representatives of the baking powder manufacturers was given in full in connection with the report on baking powders by this Bureau for the year 1920. It was recommended by the Bureau for that year that all samples of baking powder which showed a content of available carbon dioxide of less than 10 per cent be considered violations.

In January, 1921, a communication was received from Charles Wesley Dunn, representing certain baking powder manufacturers and who had also represented baking powder manufacturers at the conferences in 1920 requesting that one of the paragraphs of the definition as accepted be modified.

The Bureau is still of the opinion that the definition should remain unchanged in regard to the required amount, 12 per cent of available carbon dioxide, until such time as the United States standard shall be changed. It was fully explained at the time of the conferences that this Bureau would recommend modification of this standard of available carbon dioxide at any future time if the Federal Government should change its standard of available carbon dioxide to 10 per cent. The recommendation of the Bureau for the year 1921, however, would be to continue as in 1920 to consider misbranded all baking powders showing available carbon dioxide of less than 10 per cent.

The tabulations show the results obtained on 222 samples of baking powder. They also show the brands, the manufacturers, and the constituents of which composed. Of these 222 samples, 56 show available carbon dioxide of less than 10 per cent. This is 25.22 per cent of the total number examined and almost exactly the same percentage as was found in the samples taken for the year 1920.

BEVERAGES

The Council of Farms and Markets approved certain definitions for fruit juice beverages, also for phosphate beverages and these definitions were published in the bulletin for November, 1920. These definitions were copied in the report of this Bureau for the year 1920. Attention was called in that report also to action which had been taken in regard to certain Fruit Crushes. The report for 1920 covered 310 samples of beverages and stated in conclusion that nearly all of these samples are imitation products and, without question, should be so labeled and the label should show the constituents of which they are composed.

During the year 1921 the laboratory has examined 132 samples of beverages. These products were, with few if any exceptions, imitation products.

Very few were properly labeled to show this fact. Saccharin was found to be present in 42 of the samples.

EGG SUBSTITUTES

During the year the Bureau received six samples of powdered egg and twenty-five samples of other egg substitutes. The samples of powdered egg seem to be free from adulteration. The examination of the other egg substitutes indicated, as in previous years, that this material is a compound composed very largely of starch with a small amount of baking powder constituents and usually containing some added yellow color. In most cases this material is misbranded.

The work of the Bureau and the collection of this material wherever found in the state has served to drive the material almost entirely out of the markets. The campaign should be continued until this material, if sold at all, is sold for exactly what it is.

FRUIT BUTTER

The Council of Farms and Markets has approved the following definition for fruit butter:

"Fruit butter is the sound product made from fruit juices and clean, sound, properly matured and prepared fruit, evaporated or a semisolid mass of homogeneous consistence, with or without the addition of sugar and spices or vinegar, and conforms in name to the fruit used in its preparation."

The Bureau received for examination during the year sixty-four samples of apple butter and four of other fruit butters. The tabulation shows the results of the examination of this material. For the three years 1919, 1920, and 1921 the Bureau has endeavored to secure and analyze samples of every brand that was on sale in this state. As stated in previous reports it has been hoped that the results of these examinations would indicate what a reasonable chemical standard should be for this product. In the case of apple butter, it would seem as though some minimum standard for fruit solids could be established, such as, for example, to require a minimum of 40 per cent fruit solids.

FRUIT, DRIED AND EVAPORATED

Only six samples of this material were received by the Bureau during the year. Four were evaporated apples and two were dried apricots. The tabulation shows all results obtained on the examination of this material. All samples show an appreciable amount of sulphur dioxide present.

Attention has been called to the presence, frequently of a very large amount of sulphur dioxide in these products and the need of some uniform method of procedure by which the purchaser is advised of the presence of this sulphur dioxide or of any other foreign material.

GELATIN

Only seven samples of gelatin were received for examination during the year. The results obtained and the brands analyzed are given in the tabulation.

The sources of gelatin, the methods of examination, and the importance of certain tests for determining jelly value are described in the report on gelatin for the year 1920.

As there also stated, gelatin is usually found to contain small amounts of sulphur dioxide or sulphites which have been used for the purpose of bleaching the material. It also frequently contains traces of arsenic, copper, or other metallic impurities.

In regard to "Chemicals In Foods" the interpretation of the Bureau in regard to adulteration or misbranding is as follows:

Whenever the presence of any chemical in a food may render such food injurious to the health of the person consuming it, the sale of such food is prohibited.

Whenever chemicals have been added to food products for the purpose of preserving, bleaching, coloring or other purpose and such addition is not necessary in the manufacture of the food products, the purchaser should be notified in every case, regardless of how small an amount of chemical may be left in the food product.

Whenever small amounts of chemicals are present in food products, because of the fact that at some stage of their preparation it has been necessary to use a process which leaves small amounts of chemicals present in the food, and efforts have been made to lessen the amount present as far as possible. In such cases, very small amounts of chemicals which may be still present in the food products may come under the general head of tolerances without requiring the label to show their presence, whenever the amounts present are extremely small. In cases, however, where such chemicals are still present in appreciable amounts, the purchaser should be notified by a statement on the label.

These interpretations should apply to simple food substances or to compounds in which individual food substances subject to this rule have been incorporated.

HONEY

The laboratory received for examination during the year ninety-three samples of honey. Research work was started in December for the purpose of detecting adulterations in honey, much of this work being done on samples which were taken in December. This work has not yet been completed and cannot be included in this report.

ICE CREAM

The Bureau wishes to repeat recommendations from the report for the year 1920. The materials which are used in ice cream seem to vary to a very great extent and there seems little prospect of any real agreement among the manufacturers themselves to any one set of constituents. The only thing in which any agreement may be expected would be the establishment of some standard for the minimum percentage of milk fat that a cream should contain.

Fifty-nine samples of ice cream were examined during the year, the samples representing nearly every manufacturer of ice cream of Albany, Rensselaer, Troy, Waterford, Cohoes, Schenectady, Amsterdam, and Glens Falls.

Determinations were made of the water, solids, fat, nitrogen, sugars, and ash. The fat in every case was examined further to ascertain whether any substitution of milk fat had been made. No foreign fat was present in any sample. Tests were also made for gelatin, starch, saccharin, preservatives, and color. Two were found to be artificially colored; no starch, saccharin, or preservatives were found; gelatine was found to be present in all but two samples.

The maximum, minimum and average percentages of the chief constituents were as follows:

	Water	Solids	Fat	Sucrose	Lactose	Protein
Maximum	55.50	44.50	23.10	17.08	6.94	6.88
Minimum	75.25	24.75	4.00	8.95	1.22	1.91
Average	65.40	34.59	12.48	13.18	4.18	3.92

JELLIES AND JAMS

During the year the laboratory received 234 samples of jellies and jams. The examination consisted in making determinations of solids, water, ash, phosphoric acid in ash, acidity, reducing sugar, polarization direct and invert, preservatives, and saccharin.

MALT EXTRACT

One of the most valuable features of a true malt extract is its diastatic value. It also contains in concentrated form all the soluble matter of barley malt. Then prepared as directed in the United States Pharmacopoeia it has a specific gravity of not less than 1,350 nor more than 1,400 at 25° C.

Forty samples of malt extract and malt syrups were received for examination during the year. The specific gravity of the samples was not taken, but would correspond probably very closely to the requirements of the Pharmacopoeia. The diastatic value, as expressed in degrees Lintner, in nearly all cases is very low. The results would indicate that the material examined was, in nearly every case, not a pure malt extract but was probably a concentrated syrup in the preparation of which some amounts of malt had been used to convert starches over to sugar.

PREPARED MUSTARD

The following definition for prepared mustard was approved by the Council of Farms and Markets:

Prepared Mustard, German Mustard, French Mustard, Mustard Paste, is a paste composed of a mixture of ground mustard or mustard flour, with salt, a vinegar, and with or without spices or other condiments which do not simulate the color of yellow ground mustard. Calculated free from water, fat, salt, it contains not more than twenty-four per cent (24%) of carbohydrates (calculated as starch), not more than twelve per cent (12%) of crude fiber, not less than five and six-tenths per cent (5.6%) of nitrogen derived solely from the materials herein named.

If the addition of turmeric to prepared mustard has the effect of concealing the use of low grade materials or substitutes, or in any other way results in concealing damage or inferiority, its use would not be admissible. The manufacturer himself is most familiar with the character of his product and is in the best position to judge whether the addition of turmeric would constitute an adulteration such as is outlined above. In those cases in which turmeric can be used without concealing inferiority the presence of this ingredient should be plainly and conspicuously stated upon the label.

Sixty-five samples of prepared mustards were examined during the year and the tabulation shows the results obtained from this examination and also shows the brands and manufacturers in nearly all cases. Turmeric was found to be present in all the samples with the exception of six; starch was found in four samples, charlock in four samples, and benzoic acid in two samples.

TABLE OILS

Eighty samples have been examined during the year. The determinations which were made on the samples were the same as those described in the reports for previous years.

In previous years the reports of the examinations of table oils have called attention to the fact that nearly all the so-called compound, mixed, or vegetable oils were misbranded. For that reason the collection of table oils for the year 1921 was directed more specifically to the sale of these mixed and compound oils than to the sale of olive, cottonseed, or corn oils when so labeled. Of the eighty samples of table oils examined during the year, forty-one were of this compound class and were probably all, or nearly all, misbranded.

PICKLES

The Bureau suggested the examination of sweet pickles for the purpose of ascertaining whether or not saccharin was ever used in any of this material on the New York State markets. During the year sixty-eight samples of sweet pickles were examined and two samples of sweet relish. Saccharin was found to be present in thirteen samples of sweet pickles and benzoic acid in sixteen samples. Each of the samples of sweet relish contained saccharin and benzoic acid.

SALAD DRESSING

During the year the laboratory received for examination 102 samples of salad dressing, of this number forty-three were sold as mayonnaise dressings. The oil used in a great majority of cases seems to have been cottonseed oil.

A mayonnaise dressing is usually defined as a sauce composed of yolks of eggs and salad oil beaten together with vinegar or lemon juice to the consistency of a thick cream, and seasoned with salt, garlic, pepper, or other spices.

The tabulated results of the examination of this material, both mayonnaise and plain salad dressing, indicates a great variation in the composition of that on the market. It would seem as though this material would have to be considered as a food compound with the requirement that the constituents actually used in its composition be named.

SAUSAGE

In the opinion of the Bureau a fair definition for sausage would be something as follows:

Sausage is composed of finely chopped meat, highly seasoned with various spices, and, as usually sold, stuffed into casings made of the cleaned and prepared intestine skin of cattle, sheep, hogs, or goats. It is frequently home-made, in which case the chopped and seasoned meat is stuffed in cloth bags instead of casings or pressed together without container.

Water or ice shall not be added to sausage except for the purpose of facilitating grinding, chopping, and mixing, in which case the added water or ice shall not exceed 3 per cent, except that sausages of the class which are smoked or cooked, such as Frankfort style, Vienna style, and Bologna style, may contain added water in excess of 3 per cent but not in excess of an amount necessary to make the product palatable.

When a sausage contains an added substance or substances, or any material other than as described above, the labels shall show the added substance or substances.

In the latter part of the year 1921, seventy-five samples of pork sausage were examined. The results show a great variation in the composition of this article. The maximum, minimum and average percentages of water, solids, protein and fat were the following:

	Water	Solids	Protein	Fat
Maximum	57.68	79.57	15.37	73.04
Minimum	20.43	42.32	3.27	26.40
Average	44.03	55.96	9.59	43.18

Of these seventy-five samples, fourteen were reported to contain added water without added starch. Eighteen were reported to contain added starch without added water. Twenty were reported to contain both added water and added starch.

VINEGAR

Two hundred and forty-six samples of vinegar were received for analysis during the year. One hundred and thirty-three samples labeled cider vinegar were passed and fifty samples so labeled were reported adulterated. The percentage of adulteration of cider vinegar samples, so reported for the year, would therefore be 27.3. This compares with 25.6 per cent reported adulterated in 1920; and with 26.1 per cent reported adulterated in 1919.

In connection with the analyses of the cider vinegars which were passed it is interesting to note that the average of vinegar solids for the whole number was 1.97 grams per 100 cc. For the year 1920 the average solids for the passed cider vinegars was 2.05 grams per 100 cc; for the year 1919, 2.02 grams per 100 cc.

It is also interesting to note again the relative number of samples of different amounts of solids.

In 4 cases solids were less than	1.20.
" 7 " " " between	1.20 and 1.39.
" 15 " " " "	1.40 " 1.59.
" 22 " " " "	1.60 " 1.79.
" 27 " " " "	1.80 " 1.99.
" 15 " " " "	2.00 " 2.19.
" 16 " " " "	2.20 " 2.39.
" 13 " " " "	2.40 " 2.59.
" 10 " " " "	2.60 " 2.79.
" 2 " " " "	2.80 " 2.99.
" 2 " " " over	3.00.

YEAST

In the report of this Bureau for the year 1920 attention was called to the fact that yeast possessed food properties and that this had been known for many years. Comprehensive studies of its nutritive properties were made by the Germans during the war, and this work was continued, notably in the laboratory of the Jefferson Medical College at Philadelphia. Attention was also called to the fact that manufacturers had begun an extensive advertising campaign calling the attention of the public to yeast as a food.

The definition of yeast, approved by the Council of Farms and Markets, is the following:

The term "compressed yeast," without qualification, means distillers yeast without admixture of starch. If the starch in distillers yeast be mixed and compressed such product is misbranded if labeled or sold simply under the name "compressed yeast." Such a mixture or compound should be labeled "compressed yeast and starch," or in some similar manner. It is unlawful to sell decomposed yeast under any label.

During the year 1921, seventeen samples of yeast have been examined. It would seem as though four of these samples were misbranded because the statement in regard to the kind of starch content was inaccurate. Six others would seem to be misbranded because of the fact that they did contain some form of starch, with no statement to show its presence.

ITHACA LABORATORY

The volume of work was so large during the year, especially as the chemist had no help of any sort, that little time was left for investigation or study. Among other activities, the chemist gave a series of lectures at 8 A. M. during the Winter Dairy Course at the college, as in former years.

During the last two years, a young man worked on a problem in the ice cream manufacture under direction of the chemist in charge.

Annual report of Ithaca Laboratory for calendar year 1921:

SUMMARY OF ANALYSES COMPLETED AND REPORTED

Apple butter	2	Salad oil	4
Apples, evaporated	2	Sauer-Kraut	1
Beverage	1	Spray dust (for cabbage)....	1
Butter and substitutes.....	8	Strawberries (crushed)	1
Cabbage	4	Syrup	2
Candy	1	Tomato products	12
Cocoa	76	Turpentine	5
Cream, milk and mixtures....	383	Vinegar	113
Coffee	2		
Currants	10	Total	1,053
Egg powders and substitutes..	56		
Extracts and flavors.....	32		
Flour	5	January	100
Gelatin	2	February	98
Honey and compounds.....	151	March	104
Icing	2	April	80
Lemon juice, powdered.....	1	May	53
Linseed oil	4	June	72
Macaroni	1	July	86
Malt extract and syrup.....	2	August	66
Maple products and compounds	134	September	166
Pickles	17	October	149
Pie filling	1	November	33
Raisins	17	December	46
Total	1,053	Total	1,053

CANTON LABORATORY

During the year 1921 the Canton Laboratory made 108 milk analyses and the chemist was called as a witness in cases litigated, twice at Utica and once at Lowville.

BUREAU OF LICENSES

The report of the Bureau of Licenses for the year beginning January 1, 1921, to December 31, 1921, shows the following licenses issued and receipts from same:

COMMISSION MERCHANTS

Number of applications and fees received from commission merchants, for the period beginning January 1, 1921, and ending December 31, 1921.....	667— \$6,670 00
Number of licenses issued to commission merchants during this period	665
Cases pending	2
(These cases are awaiting completion of papers.)	
Number of fees Bureau of Accounts was authorized to release to account of State Treasurer, for which licenses have been issued	665— \$6,650 00

RECOVERIES ON BONDS

During the period covered by this report, this Bureau has made collections on the bonds of two bankrupt commission merchants, viz.: Ruhlman & Company, Inc., and John K. Lasher & Bro., Inc.

In the case of Ruhlman & Co., Inc., bankrupt commission merchants, verified claims as filed amounted to over \$60,000. The money was paid pro rata on each claim, the percentage being a little over 4½ per cent.

In the case of John K. Lasher & Bro., Inc., bankrupt commission merchants, but one claim was filed in the amount of \$195. The full amount of the claim was paid.

MILK DEALERS

Number of applications and fees received prior to January 1, 1921, for which licenses were issued between January 1, and August 31, 1921.....	29	
Number of applications and fees received from January 1, to August 31, 1921.....	22	
Number of applications and fees received from September 1, to December 31, 1921.....	230	
		281
Number of licenses issued to milk dealers from January 1, to December 31, 1921.....		133
		148
Cases now pending:		
For year ending August 31, 1921.....	16	
For the present license year beginning September 1, 1921, to December 31, 1921.....	132	
		148
Number of fees released to State Treasurer through Accounts Bureau, for which licenses have been issued....	133— \$1,330 00	

The Bureau of Licenses is holding \$230, fees for which no licenses were issued for the year ending August 31, 1920 (some of these cases were referred to the Attorney-General, others are awaiting the completion of papers).

The Bureau of Accounts is holding \$200, fees received from 20 milk dealers whose cases were turned over to the Attorney-General for prosecution during

the years ending August 31, 1918, and August 31, 1919, no licenses having been issued in these cases.

Note.—The matter of the disposition of these fees has been taken up with the Attorney-General but no opinion has been rendered on same.

Number of cases turned over to the Attorney-General for prosecution from January 1, 1921, to December 31, 1921..... 11

COLD STORAGE WAREHOUSES

Number of cold storage applications and fees received
from January 1, 1921, to December 31, 1921..... 108— \$2,820 00

Number of cold storage licenses issued from January 1st
to December 31, 1921..... 104

Number of cold storage fees returned—cases did not
come within the meaning of the law..... 4— \$100 00

Number of fees which the Bureau of Accounts has been
authorized to release to the State Treasurer, for which
licenses have been issued 104— \$2,720 00

98 fees, at \$25..... \$2,450 00
2 fees, at \$30..... 60 00
1 fee, at \$35..... 35 00
2 fees, at \$40..... 80 00
1 fee at \$95..... 95 00

\$2,720 00

TOTAL AMOUNT OF FEES DEPOSITED TO ACCOUNT OF STATE TREASURER BY BUREAU OF LICENSES

Section 55, A. L. Milk Dealers Law..... \$1,330 00
Article XII-A, A. L. Commission Merchants Law..... 6,650 00
Article 4-A, Farms and Markets Law, Cold Storage Warehouses 2,730 00

\$10,700 00

LEGAL BUREAU

The work of the Legal Bureau consists in advising the Commissioners, Directors of Bureaus, and other persons where necessary, as to the law under which they are operating and as to the many phases of its application to the work provided to be done under the Farms and Markets Law, the Agricultural Law, and the General Business Law; in corresponding and consulting with attorneys who are appointed by the Attorney-General to try cases under the provisions of such laws, and advising in many instances with Farm Bureau Managers as to the application of the law and the different phases of the work which such bureaus are performing; in advising with and instructing agents of the Department as to the methods to be pursued in getting evidence in cases of violations of any of the above laws; and in examining all the evidence submitted by the Commissioners or the directors of the different bureaus for purported or possible violations of any of the said laws.

During the calendar year of 1921 from the evidence submitted to this Bureau from the Division of Foods and Markets there was found evidence which it was believed warranted the reference to the Attorney-General of 242 cases for violations of the provisions of the Farms and Markets Law and the Agricultural Law, as follows:

Cold Storage	152
Pure Food (Art. 8)	14
Vinegar (Art. 4)	63
Milk License	2
Action on bond	2
Weights and Measures	9
	<hr/>
	242 cases
	<hr/>

Penalties collected\$4, 536.00.

The report made to this office by the Attorney-General for the said calendar year shows, as above, that that official collected in penalties from the cases that had been referred to him \$4,536.

Some of the evidence submitted to this Bureau was found not to be sufficient to constitute violations of the provisions of the statute. In such instances the papers are sent back to the Bureau from which received with advice to that effect.

Of necessity there have been frequent consultations with the Attorney-General's office relative to the principles involved in and the facts constituting the violations in cases referred to him, and oftentimes in relation to affidavits submitted to that official subsequent to the reference of the cases which have a bearing upon the cases or some of the facts in connection therewith. These affidavits sometimes disclose facts or conditions not known at the time of the reference of the cases and require careful consideration before determining whether further action should be taken. When cases are referred by the Attorney-General to local attorneys, correspondence is often necessitated between such attorneys and this Bureau in relation to what the witnesses can testify to and what weight such testimony would have viewed from a legal standpoint. Considerable time is also taken in notifying the witnesses in the different cases and having them ready for trial; also, in corresponding with the defendant, and in some cases with the manufacturer, notifying them that their goods were exposed for sale in violation of the statute.

Other work of a minor nature consists in advising with those interested in preparing bills as amendments to the laws the enforcement of which come under the surveillance of the Department of Farms and Markets.

NEW YORK CITY OFFICE

In New York City all departmental food and marketing activities are carried on through a New York City office, which has a total of fifteen employees. Its location in the largest consuming market in the country places it in a position of great responsibility in relation to both wholesale marketing problems and consumers' problems. Lines of work established as a part of the regular routine of the New York Office after five years' development now include: (1) market reporting and market news service; (2) administration of licensing and bonding laws applying to commission merchants and to milk dealers; (3) investigations of complaints and claims from farmers and shippers relative to shipments to this market; (4) assistance to farmers in establishing contact with reliable buyers for their products; (5) instruction as to methods of packing and shipping to this market in answer to inquiries; (6) assistance to consumers in organizing and operating consumers' cooperative associations; (7) inspection of retail stores for enforcement of food products; (8) following-up of shipments at request of shippers and reporting their condition on arrival and the disposition of them; (9) inspection of farm products from New York State sections at request of receiver or shipper to settle controversies as to quality, grade, or condition.

In addition to these routine activities the New York office arbitrates disputes between shippers and receivers relating to handling of farm products on request of both parties. It conducted during 1921 special investigations of such subjects as "Hay Marketing in New York City," "New York City as a Market for Barreled Apples," "The Food Supply of the Port of New York District," and "Types of Containers Used in Shipping Fruits and Vegetables to the New York Market," on which complete reports were prepared for publication. It also directed a number of special investigations of consumers' food problems made by advanced students of Teachers' College, Columbia University. From time to time quick surveys were made of food prices in retail stores for purposes of comparison with wholesale prices. To increase the opportunity for service to consumers, plans were prepared with several large civic organizations for studies and educational meetings in the marketing field.

The New York office has gradually become established as a center of information in New York City on all food marketing questions. A library of books, pamphlets, and periodicals on marketing has been built up for reference use, not only the Department employees, but of the general public.

MARKET REPORTING AND MARKET NEWS SERVICE

In the collection and distribution of market information greater progress was made during 1921 than in any other one line of activity. Early in the year a conference was held with representatives of the United States Bureau of Markets, the Federation of Farm Bureau Associations, and the State College of Agriculture which resulted in a plan for linking together the federal and state market-reporting machinery so as to give to farmers of the state through one channel information as to all important national markets as well as New York City. This plan proposed the establishment of a leased telegraph wire by the state from New York to Buffalo with drop stations at Rochester, Syracuse, Utica, and Albany.

Legislation to provide for this leased wire failed of passage. Some other method therefore had to be found for getting information to the producing sections quicker than the mailed mimeograph report. Through the help of the publisher of a large up-state morning newspaper, an arrangement was made with the Associated Press to carry over its telegraph wires every evening to six of the most important morning papers in the principal up-state cities, a complete news account of what happens in the wholesale markets for farm products during the day. This was the beginning (May, 1921) of

a new era in market reporting in this state. Six months later the New York office was sending out market news and quotations over the wires of all the telegraph news service agencies to nearly a hundred up-state afternoon and morning daily papers.

The market reporters of the Department are out in all the wholesale markets for farm products every day and secure price quotations and other market information direct from personal contact with the wholesale receivers, commission men, and buyers. The fruit and vegetable wholesale market reaches the height of its activity in the early morning hours before daylight. The farmers' public markets are most active about daylight. The hay, live stock, butter and eggs, and live poultry wholesale markets do most of their business between 8 A. M. and 1 P. M. The market reporting staff of the department gives special attention to products from New York State sections and covers various markets that are not reported on by the United States Bureau of Markets from a national standpoint.

Information as to the condition of the market for New York State products in other large national markets is relayed to the department's office from the New York City office of the United States Bureau of Markets as to what comes over their leased telegraph wire system. This material is edited from the standpoint of the special interest of the New York producers and sent out with the department's own quotations for publication by newspapers through the telegraph news agencies. These reports cover quotations and market conditions for fruits, vegetables, butter, eggs, cheese, country dressed meats, live and dressed poultry, hay and grain, honey, maple products, and dry beans. Buffalo feed prices are supplied from the Buffalo office. Information is occasionally given as to chemical fertilizers and other special commodities. In the market news releases to up-state morning papers the following special features were included during the last half of the year on one or two days each week:

Comparison of prices of New York cabbage, onions, apples and potatoes in large national markets.

Weekly review of national receipts and cold storage movement of dressed poultry.

Summary of Rochester F. O. B. prices.

Summary of situation of British apple market for barreled apples.

Review of receipts and holdings of butter, cheese and eggs.

Weekly review of national conditions, production and marketing of butter.

Weekly summary of total New York City carlot receipts of fruits and vegetables.

Semi-monthly national review of honey markets.

Monthly national review of markets for fluid milk and for condensed and evaporated milk.

In October, 1921, the printed weekly market report was discontinued by order of the Board of Estimate and Control because of the expense of printing. In spite of the great increase in distribution of market information through newspapers and other channels, the demand has steadily increased for the mimeographed market reports issued daily by the New York office. A list of these reports follow:

1. An early morning report on the sales of produce in the farmers' public markets issued at 10.30 A. M. This is published by one of the newspapers having a large circulation on Long Island and is sent out to a mailing list of approximately 125 farmers, newspapers, and information centers in near-by producing sections.

2. A regular daily market report issued in mimeograph form the first four days each week and sent only on request to a mailing list which includes county farm bureaus, individual farmers, shippers, wholesale dealers, and some buyers. There were 750 addresses on the mailing list for this report in December.

3. A weekly summary giving the trend of the wholesale markets and Friday's quotations issued in mimeograph form every Friday. This was established in October to take the place of the printed weekly report which had a circulation of about 8,000. Because of the mechanical difficulties in putting

out large numbers of mimeographed reports with the present office equipment, no effort has been made to encourage applications for this report, but in December the mailing list included 940 names.

4. A daily one-page mimeograph summary of quotations on the New York market in concise form for publication in daily and weekly newspapers. This is sent to all the daily newspapers in the state, except those getting full telegraph reports from this office and to all the weekly newspapers in the state on the day nearest the day of the week on which they go to press. In some cases this report is sent by special delivery at the expense of the newspaper.

SPECIAL NEWS RELEASES ON MARKETING SUBJECTS

In addition to these daily food market reports, the New York office issued throughout the year a weekly summary of information regarding wholesale market conditions for consumers for publication in metropolitan Sunday newspapers. The purpose of this consumers' weekly review of wholesale markets was to keep the general public in touch with important changes in wholesale market conditions to give them the information on which they might act in checking profiteering among retailers and to bring about a better understanding on the part of the general public as to the farmers' problems in marketing his products. When there were gluts in the markets and wholesale prices went to such low levels that the farmers were scarcely able to pay the freight on their products, it was considered to be the duty of this office to let the consuming public know of this condition. Publicity, more than anything else, can bring about a closer correlation of retail prices with wholesale prices so that the consumer at least may get some benefit from the market gluts that prove so disastrous to the producers.

In February, 1921, the receipts of fresh eggs suddenly increased greatly with the coming of warm weather in the southern and Pacific coast sections. Wholesale prices dropped to low level without any corresponding drop in retail prices. A quick survey was made of retail prices in representative sections of the city and a release given out to all the metropolitan newspapers exposing the situation and calling attention to the fact that consumers should now be able to buy fresh eggs at prices that would warrant a much larger consumption. As a result of this publicity retail prices immediately dropped throughout the city, consumption of eggs greatly increased and the outlet for a fresh egg supply was much improved. From time to time throughout the year situations similar to this arose in regard to other products and the publicity given to the low wholesale prices brought about a better adjustment of retail prices and an increased demand for the product of which there was an oversupply. Another example was the situation in regard to pure maple syrup in the fall. The commission receivers of pure maple syrup from up-state sections had large stocks of pure maple syrup on hand in which they were having difficulty in selling at \$1.50 per gallon. A Sunday newspaper article about the decline and demand for pure maple syrup, the extent to which other cheap syrups had been substituted, and the low wholesale prices at which pure syrup could be obtained, resulted in greatly increased demand for this product, which eventually cleared up the entire supply in the wholesale market.

The market news release prepared every day at 11 A. M. for afternoon papers and covering the events of special interest in the wholesale produce markets during the morning are now sent by telegraph tickers of the principal local news distributing agency in New York City to practically all the metropolitan papers. Market information is supplied by telephone daily in answer to inquiries from city newspapers.

LICENSING OF COMMISSION MERCHANTS AND MILK DEALERS

The administration of the laws relating to licensing and bonding commission merchants and milk dealers require a large amount of investigational work in New York City. The applications for license and the bonds of firms in New York City subject to these license requirements are examined by the

New York office and forwarded to the Bureau of Licenses. Before licenses can be granted to milk dealers to receive milk from farmers an examination must be made of the dealer's assets and liabilities and an appraisal of his property. In 1921, 227 applications for commission merchant's license and 18 milk dealers' licenses were handled by this office.

Whenever a licensed and bonded firm fails or goes into bankruptcy a thorough examination of the firm's outstanding accounts must be made at once in order to protect the interests of the consignee or creditors and to determine whether an adjustment of the bond is necessary. There was a greater number of such failures in 1921 than in previous years and the records of 36 commission merchants and milk dealers had to be examined by the New York office and the cases followed through until complete settlement of all accounts was made to determine whether firms are receiving farm products for sale on commission and therefore subject to the commission licensing law. It was necessary to make an extensive survey of all wholesale food dealers in the city which had not yet been completed at the end of the calendar year. The commission merchant's license law makes it possible for the department to make thorough investigations of any complaints relative to commission sales of farm produce and if necessary to take action against the bond of a commission merchant to recover amounts due the consignor. The policy has been to get all the facts in regard to such complaints and to make a settlement without the formality of public hearing or legal action wherever possible. In 1921 approximately 205 specific complaints against commission merchants and other dealers were received in New York City. The majority of these related to improper returns and necessitated extensive investigation. The sums involved in most cases were comparatively small, although of much importance to the small shipper who had no other means of protecting himself than by appeal to this department. The total sum collected on claims by agents of the New York office and forwarded to shippers during the year was \$1,736.12. In addition to this a considerably larger amount of money was sent direct by the merchants to shippers as a result of the department's investigation.

CONTACT BETWEEN PRODUCER AND MARKET

Because of the great variety of inquiries received in daily correspondence from farmers and shippers who want information as to where and how they can market their products it is difficult to summarize briefly what was done during the year toward supplying such information. About 1,000 such letters of inquiry were received. The information sought covered the marketing of a wide variety of commodities. The most frequent requests related to marketing of fruits and vegetables in season, eggs, live rabbits, and country dressed meats. Advice was also requested as to marketing of such products as white rats, roach fish, oysters, capons, live poultry, ferrets, loose hay, maple syrup, honey, wool, and Christmas trees.

To facilitate the answering of such inquiries special memoranda were prepared in mimeograph form on the following subjects:

- List of dealers in second-hand barrels.
- List of manufacturers of barrels, baskets, and other containers.
- List of dealers in new and second-hand egg cases.
- List of containers commonly used in shipping fruits and vegetables to the New York City markets.
- Methods of packing and shipping eggs to avoid breakage.
- Information on the marketing of tame rabbits' skins and meat.
- Special instructions for dressing calves.

A survey was made of all firms in the metropolitan area who purchased carlots of hay and a list prepared of addresses of such firms for the use of cooperative hay marketing associations. Special lists of chain stores and other retail stores that might be interested in buying certain products direct from producers' organizations were supplied in response to various inquiries. Other lists of dealers in special commodities outside those covered by the regular licensed commission merchants were prepared.

FOLLOW-UP OF SHIPMENTS

Farmers who ship goods to commission merchants or other dealers with whom they have had no previous relations often ask this office to follow up their produce on arrival in the markets in order to see that proper returns are made. In such cases the shipper must send, at the time he ships, a post card or letter giving the name and address of the dealer to whom he is shipping, the quantity and character of the consignment, the date of shipment and the transportation agency. The majority of requests for follow up of shipments during 1921 came from egg shippers. However such commodities as hay, straw, potatoes, cabbage, honey, and fowls were followed up and reported upon.

INSPECTION OF FOOD SHIPMENTS

At the request of shippers or receivers, the New York office inspects food products to ascertain the condition in which they arrive on the local markets. The development of this type of service has been greatly handicapped through the lack of persons especially trained for this work and inspections have been made only in response to urgent requests and only of shipments which the United States Bureau of Markets and Crop Estimates could not inspect because of their intrastate origin. These inspections totaled 111, of which 84 related to eggs.

ADULTERATION AND MISBRANDING

The two food inspectors working in New York City made inspections of 5,360 retail stores in 1921 for the purpose of enforcing the state laws relative to adulteration and misbranding of food products. In this period 420 samples as evidence of violations were forwarded to the laboratory in Albany. In addition about 250 notices for violations of the pure food laws were served.

HAY MARKETING INVESTIGATION

An intensive study of hay marketing in New York City was made by the Director of the New York City office. The report of this investigation describes the various hay-receiving terminals, the methods of handling hay on consignment, the railroad embargo and permit system, the decline in the consumption of hay in this market, the testing of weights and grading, and the underlying causes of continuous fluctuations in hay prices. The concluding chapter of the report contains an analysis of the problem of marketing hay in New York City from the standpoint of a farmer and definite recommendations for the improvement of hay marketing conditions here. These recommendations include the formation of a state-wide cooperative hay marketing association to enable farmers to market their hay collectively. It was recommended that such an association build and operate a terminal warehouse and hay market on the New Jersey shore with connections to all the trunk line railroads and ample facilities for storing surplus receipts so that a comparatively small number of carloads would not constitute a glut in the market as at present. The report of this inspection has not yet been printed but has been given considerable publicity.

APPLE MARKETING STUDY

With the idea of assisting the cooperative apple marketing associations in the state in studying their problem of marketing barreled apples, the New York City office prepared in form for publication a report covering the market prices and receipts of 52 varieties of apples in the shipping season of 1920-21. Receipts of apples on the New York market were classified according to variety and source of supply and charts prepared showing the relationship between supply and prices.

In order to ascertain the attitude of wholesalers, restaurant owners, and retailers toward barreled apples as compared with boxed apples, several hundred such firms were interviewed. The investigation included a study of the ultimate disposition of the barreled apples received in the local markets.

COOPERATIVE ORGANIZATION

A large proportion of the time of one member of the staff of the New York office was given to consumers' cooperative associations. The assistance to consumers' organizations took the form very largely of advisory and educational work, including personal interviews with people who called for information, public addresses, preparation of material for publication, field investigation of cooperative enterprises, organization of educational trips for managers of cooperative associations, and organization of advisory committees on technical problems.

OTHER EDUCATIONAL ACTIVITIES

By way of meeting the need for greater general education in regard to food distribution problems, the New York office carried on various other activities of an educational nature. These included public addresses to civic organizations, women's clubs and university classes, the circulation of the department's motion picture of the New York wholesale markets entitled "Behind the Breakfast Table," the arrangement of several all-night tours through the wholesale produce markets, and the writing of various articles for marketing journals and other publications.

One of the most important educational trips through the markets was that conducted for a party of seventy-five members of the association of Vegetable Growers of America which came to New York from their convention in Albany for this special purpose. The trip began at midnight and continued until 10 A. M. the following morning, covering the railroad piers where produce is received and sold, the wholesale market section, the various farmers' markets, the railroad yards where bulk produce is sold direct from the cars, and the live stock market. A similar educational trip was arranged for the students of the Connecticut Agricultural College, two such trips for students of Teacher's College, Columbia University, and several smaller parties of persons especially interested in marketing questions were taken through the markets.

BUFFALO OFFICE

Work of the Buffalo office for the year is herewith briefly presented, no attempt being made to record the numerous personal and telephone calls having to do with matter pertaining to the laws, rules and regulations of this Department.

Under the head of inquiries, requests for information on the marketing of live and dressed rabbits were replied to, as were numerous miscellaneous inquiries relating to market problems, labeling, and other matters. Twenty-one requests from railroad freight agents for data and information establishing price of certain commodities on certain dates were given attention, the data given being used in the settlement of claims filed against the carrier.

COMPLAINTS

Ten complaints against receivers were investigated and shippers advised of facts in the case. Settlements were effected in some cases with litigation to follow in others.

SPECIAL INVESTIGATIONS

Agent O'Donnel was assigned to special work on vinegar during part of April and May, covering plants at Fairport, Canastota, Albany, Sidney, Norwich, and Rome. A case was also investigated involving a consignment of sugar by the Republic Packing Corporation at Olean in which reports were forwarded to Albany.

Special investigations inaugurated early in September and lasting until November, covering the wholesale trade in cold storage butter and eggs, resulted in submitting 22 cases to Albany. This activity coming directly under the supervision of the Bureau of Markets and Storage, findings and determinations of the Legal Department were reported direct to that Bureau and are not included in this report.

In addition to the special work, with only one field man available, 2,088 retail stores were visited in observance of cold storage rules and regulations, 41 violations being reported. On food inspection work, 92 samples were taken.

MARKET NEWS SERVICE

In addition to the daily produce market report, which continues to gain in popularity, this office, in conjunction with the Federal and State service, furnishes the Associated Press with a daily report of conditions and prices on wholesale feed market. Two Buffalo morning papers are featuring this information in their market news.

A total of 8,515 cars of perishable products reported. This information is gathered daily, classified, tabulated and filed for reference.

FINANCIAL REPORT

DIVISION OF FOODS AND MARKETS

Statement of Appropriations and Expenditures for the Fiscal Year July 1, 1920 — June 30, 1921.

Chapter	Title	Appropriations	Expended	Balance
165-1-1920	Personal service, employees	\$161,430 00	\$153,614 53	\$7,815 47
	Maintenance and operation:			
165-1-1920	Printing, general	\$29,000 00	\$25,421 54	\$3,578 46
165-1-1920	Printing departmental reports	12,000 00	12,000 00	.....
165-1-1920	Equipment and supplies	10,000 00	9,999 12	88
165-5-1920	Printing departmental reports	8,558 70	8,529 96	28 74
165-1-1920	Advertising	500 00	261 00	239 00
165-1-1920	Traveling expenses	45,000 00	40,384 79	4,615 21
165-1-1920	Communication	14,000 00	13,469 62	530 38
165-1-1920	Rents	7,500 00	6,647 40	852 60
	Total	\$126,558 70	\$116,713 43	\$9,845 27
	Totals chargeable to fiscal year, July 1, 1920 to June 30, 1921	\$287,988 70	\$270,327 96	\$17,660 74

Balance of Appropriations in Force July 1, 1920, with Expenditures Chargeable to Prior Years.

Chapter	Title	Balance	Expended	Balance
	Maintenance and operation:			
177-2-1919	Rent	\$50 00	.....	\$50 00
177-1-1919	Printing, general	3,463 66	3,460 90	2 76
177-1-1919	Printing departmental reports	5,515 20	5,425 89	89 31
177-1-1919	Advertising	280 40	217 60	62 80
177-1-1919	Equipment and supplies	2,595 05	2,595 05	.....
177-1-1919	Traveling expenses	7,369 58	7,306 78	62 80
177-1-1919	Communication	5,191 71	206 91	4,984 80
177-1-1919	Rent	1,488 42	300 00	1,188 42
	Totals chargeable to years prior to July, 1920	\$25,954 02	\$19,513 13	\$6,440 89

† Lapee c April 12, 1920.

RECAPITULATION

Expenditures chargeable to fiscal year 1920-1921:	
Personal service	\$153,614 53
Maintenance and operation	116,713 43
Total	\$270,327 96
Expenditures chargeable to prior years:	
Maintenance and operation	19,513 13
Total	\$289,841 09
Receipts, July 1, 1920 to June 30, 1921:	
Commission merchants' licenses	\$6,510 00
Milk licenses	2,580 00
Cold storage licenses	2,475 00
Miscellaneous	71 02
Total	\$11,636 02

STATE OF NEW YORK

THIRTY-FOURTH ANNUAL REPORT
OF THE
NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY

AND OF THE
AGRICULTURAL EXPERIMENT STATION

ESTABLISHED UNDER THE
DIRECTION OF CORNELL UNIVERSITY
ITHACA, NEW YORK

1921

A. R. MANN, Dean and Director	
CORNELIUS BETTEN,	W. H. CHANDLER,
Vice Dean of Resident Instruction	Vice Director of Research
M. C. BURRITT, Vice Director of Extension	

Transmitted to the Legislature January 16, 1922

UTICA
STATE HOSPITALS PRESS
1922

THIRTY-FOURTH ANNUAL REPORT
OF THE
NEW YORK STATE COLLEGE OF AGRICULTURE AT
CORNELL UNIVERSITY AND OF THE AGRICULTURAL EXPERIMENT
STATION ESTABLISHED UNDER THE DIRECTION
OF CORNELL UNIVERSITY

STATE OF NEW YORK

DEPARTMENT OF FARMS AND MARKETS

ALBANY, January 16, 1922

To the Legislature:

In accordance with the provisions of the Statutes relating thereto, I have the honor to transmit herewith the Thirty-fourth Annual Report of the New York State College of Agriculture at Cornell University, as a part of the Annual Report of the Department of Farms and Markets.

BERNE A. PYRKE,
Commissioner of Farms and Markets.

NEW YORK STATE COLLEGE OF AGRICULTURE

STAFF OF INSTRUCTION AND EXTENSION

Albert William Smith, B. M. E., M. M. E., Acting President of the University.
Albert Russell Mann, B. S. A., A. M., Dean of the College of Agriculture, Director of the Experiment Station, and Director of Extension.
Isaac Phillips Roberts, M. Agr., Professor of Agriculture, Emeritus.
John Henry Comstock, B. S., Professor of Entomology and General Invertebrate Zoology, Emeritus.
John Lemuel Stone, B. Agr., Professor of Farm Practice, Emeritus.
Liberty Hyde Bailey, M. S., LL. D., Litt. B., Ex-Dean, Professor, Emeritus.
Whitman Howard Jordan, LL. D., Professor of Animal Nutrition, Emeritus.
Henry Hiram Wing, M. S. in Agr., Professor of Animal Husbandry.
Thomas Lyttleton Lyon, Ph. D., Professor of Soil Technology.
James Edward Rice, B. S. A., Professor of Poultry Husbandry.
George Walter Cavanaugh, B. S., Professor of Chemistry in its Relations to Agriculture.
George Nieman Lauman, B. S. A., Professor of Rural Economy.
Herbert Hice Whetzel, M. A., Professor of Plant Pathology.
George Frederick Warren, Ph. D., Professor of Agricultural Economics and Farm Management.
William Alonzo Stocking, M. S. A., Professor of Dairy Industry.
Wilford Murry Wilson, M. D., Professor of Meteorology.
Ralph Sheldon Hosmer, B. A. S., M. F., Professor of Forestry.
James George Needham, Ph. D., L. H. D., Professor of Entomology and Limnology.
Rollin Adams Emerson, D. Sc., Professor of Plant Breeding.
Harry Houser Love, Ph. D., Professor of Plant Breeding.
Donald Reddick, Ph. D., Professor of Plant Pathology.
George Alan Works, B. Ph., M. S. in Agr., Professor of Rural Education.
Flora Rose, B. S., M. A., Professor of Home Economics.
Martha Van Rensselaer, A. B., Professor of Home Economics.
James Adrian Bizzell, Ph. D., Professor of Soil Technology.
Glen Washington Herrick, B. S. A., Professor of Economic Entomology.
Howard Wait Riley, M. E., Professor of Rural Engineering.
Harold Ellis Ross, M. S. A., Professor of Dairy Industry.
Hugh Charles Troy, B. S. A., Professor of Dairy Industry.
Samuel Newton Spring, B. A., M. F., Professor of Silviculture.
Karl McKay Wiegand, B. S., Ph. D., Professor of Botany.
William Henry Chandler, M. S. in Agr., Ph. D., Professor of Pomology and Vice Director of Research.
Arthur Bernhard Recknagel, B. A., M. F., Professor of Forest Management and Utilization.
Merritt Wesley Harper, M. S., Professor of Animal Husbandry.
Cyrus Richard Crosby, A. B., Extension Professor of Entomology.
Elmer Seth Savage, M. S. A., Ph. D., Professor of Animal Husbandry.
Edward Albert White, B. Sc., Professor of Floriculture.
Alvin Casey Beal, Ph. D., Professor of Floriculture.
Herbert Andrew Hopper, B. S. A., M. S., Extension Professor of Animal Husbandry.
Edward Sewall Guthrie, M. S. in Agr., Ph. D., Professor of Dairy Industry.
Maurice Chase Burritt, M. S. in Agr., Vice Director of Extension.
William Charles Baker, B. S. A., Professor of Drawing.
Mortier Franklin Barrus, Ph. D., Extension Professor of Plant Pathology.
Lewis Josephus Cross, B. A., Ph. D., Professor of Chemistry in its Relations to Agriculture.
Oskar Augustus Johannsen, A. M., Ph. D., Professor of Entomology.
Clyde Hadley Myers, Ph. D., Professor of Plant Breeding.

Bristow Adams, B. A., Professor in Extension Service, Editor, and Chief of Publications.

Dick J. Crosby, M. S., Professor in Extension Service.

Asa Carlton King, B. S. A., Professor of Farm Practice and Farm Superintendence.

Cornelius Betten, Ph. D., Vice Dean of Resident Instruction.

George Abram Everett, A. B., LL. B., Professor of Extension Teaching.

Lewis Knudson, B. S. A., Ph. D., Professor of Botany.

E. Gorton Davis, B. S., Professor of Landscape Art.

Ralph Wright Curtis, M. S. A., Professor of Landscape Art.

Claude Burton Hutchison, M. S. in Agr., Professor of Plant Breeding.

Jacob Richard Schramm, A. B., Ph. D., Professor of Botany.

Harry Oliver Buckman, M. S. A., Ph. D., Professor of Soil Technology.

Ralph Hicks Wheeler, B. S., Professor in Extension Service.

Paul Work, A. B., M. S. in Agr., Professor of Vegetable Gardening.

John Bently, jr., B. S., M. F., Professor of Forest Engineering.

Paul J. Kruse, A. B., Ph. D., Professor of Rural Education.

Rolland Maclaren Stewart, A. B., Ph. D., Professor of Rural Education.

James Ernest Boyle, Ph. D., Professor of Rural Economy.

Ezra Dwight Sanderson, B. S., Professor of Rural Social Organization.

Homer Columbus Thompson, B. S., Professor of Vegetable Gardening.

William Joseph Wright, M. S., Extension Professor of Rural Education and State Leader of Junior Extension.

Warren Simpson Thompson, A. M., Ph. D., Professor of Rural Social Organization.

Cora Ella Binzel, Acting Professor of Rural Education.

Byron Burnett Robb, M. S. in Agr., Professor of Rural Engineering.

Annette J. Warner, Professor of Home Economics.

James Kenneth Wilson, B. S., Ph. D., Professor of Soil Technology.

Blanche Evans Hazard, M. A., Professor of Home Economics.

Edmund Louis Worthen, M. S., Extension Professor of Soil Technology.

Julian Edward Butterworth, Ph. D., Professor of Rural Education.

Roscoe Wilfred Thatcher, B. S., M. A., D. Agr., Professor of Plant Chemistry.*

Ulysses Prentiss Hedrick, Sc. D., Professor of Pomology.*

Lucius Lincoln Van Slyke, Ph. D., Professor of Dairy Chemistry.*

Fred Carlton Stewart, M. S., Professor of Plant Pathology.*

Percival John Parrott, M. A., Professor of Entomology.*

Robert Stanley Breed, Ph. D., Professor of Dairy Bacteriology.*

Rudolph John Anderson, Ph. D., Professor of Animal Nutrition.*

Reginald Clifton Collison, M. S., Professor of Soil Technology.*

Robert Pelton Sibley, M. A., L. H. D., Professor and Secretary.

James Chester Bradley, Ph. D., Professor of Entomology and Curator of Invertebrate Zoology.

George Charles Embody, Ph. D., Professor of Aquiculture.

Mrs. Helen Binkered Young, B. Arch., Professor of Home Economics.

Mrs. Anna Botsford Comstock, B. S., Professor of Nature Study.

Earl Whitney Benjamin, M. S. in Agr., Ph. D., Professor of Poultry Husbandry.

Arthur Johnson Eames, A. M., Ph. D., Professor of Botany.

John Hall Barron, B. S. A., Extension Professor of Field Crops.

Gad Parker Scoville, B. S. in Agr., Professor of Farm Management.

Leonard Amby Maynard, A. B., Ph. D., Professor of Animal Husbandry.

Montgomery Robinson, Litt. B., B. S., Professor in Extension Service.

Arthur John Heinicke, B. S. A., M. A., Ph. D., Professor of Pomology.

Olney Brown Kent, B. S., Ph. D., Professor of Poultry Husbandry.

Edward Gardner Misner, B. S., Ph. D., Professor of Farm Management.

Helen Monsch, B. S., M. A., Professor of Home Economics.

William Irving Myers, B. S., Ph. D., Professor of Farm Finance.

Theodore Hildreth Eaton, A. M., Ph. D., Professor of Rural Education.

Orville Gilbert Brim, B. Ped., M. A., Ph. D., Professor of Rural Education.

Howard Edward Babcock, Ph. B., Professor of Marketing.

Carl Edwin Ladd, Ph. D., Extension Professor of Farm Management.

* By affiliation with the New York Agricultural Experiment Station at Geneva.

Walter Warner Fisk, M. S. in Agr., Professor of Dairy Industry.
 James Duncan Brew, B. S., Extension Professor of Dairy Industry.
 Doak Bain Carrick, A. B., Ph. D., Professor of Pomology.
 Lester Wayland Sharp, Ph. D., Professor of Botany.
 Jay Coryell, B. S. in Agr., County Agent Leader.
 Charles Arthur Taylor, Assistant County Agent Leader.
 Lloyd R. Simons, B. S. A., Assistant County Agent Leader.
 Earl Alvah Flansburgh, B. S., Assistant County Agent Leader.
 Harry Morton Fitzpatrick, Ph. D., Assistant Professor of Plant Pathology.
 Robert Matheson, M. S. in Agr., Ph. D., Assistant Professor of Economic Entomology.
 Arthur Augustus Allen, Ph. D., Assistant Professor of Ornithology.
 Forest Milo Blodgett, Ph. D., Assistant Professor of Plant Pathology.
 Frank Elmore Rice, A. B., Ph. D., Assistant Professor of Chemistry in its Relations to Agriculture.
 John Clarence McCurdy, B. S., C. E., Assistant Professor of Rural Engineering.
 Clarence A. Boutelle, Assistant Extension Professor of Animal Husbandry.
 George Harris Collingwood, B. S., A. M., Assistant Extension Professor of Forestry.
 Otis Freeman Curtis, A. B., Ph. D., Assistant Professor of Botany.
 Thomas Joseph McInerney, M. S. in Agr., Assistant Professor of Dairy Industry.
 Eugene Davis Montillon, B. Arch., Assistant Professor of Landscape Art.
 Juan Estevan Reyna, E. E., Assistant Professor of Rural Engineering.
 Henry William Schneck, B. S., M. S. A., Assistant Professor of Vegetable Gardening.
 Louis Melville Massey, A. B., Ph. D., Assistant Professor of Plant Pathology.
 Beulah Blackmore, B. S., Assistant Professor of Home Economics.
 Mary Frances Henry, A. B., Assistant Professor of Home Economics.
 Sarah Lucile Brewer, B. S., Assistant Extension Professor of Home Economics.
 Helen Canon, B. A., B. S., Assistant Extension Professor of Home Economics and State Leader of Home Demonstration Agents in charge of Program.
 Gustave Frederick Heuser, B. S., M. S. in Agr., Ph. D., Assistant Professor of Poultry Husbandry.
 Earle Volcart Hardenburg, B. S., M. S. in Agr., Ph. D., Assistant Professor of Vegetable Gardening.
 Allan Cameron Fraser, B. S., Ph. D., Assistant Professor of Plant Breeding.
 Claribel Nye, B. S., Assistant Extension Professor of Home Economics and State Leader of Home Demonstration Agents in charge of Study Clubs.
 Peter Walter Claassen, M. A., Ph. D., Assistant Professor of Biology.
 Roy Glen Wiggans, M. S. A., Ph. D., Assistant Professor of Plant Breeding.
 Charles Chupp, A. B., Ph. D., Assistant Extension Professor of Plant Pathology.
 Frank Pores Bussell, B. A., Ph. D., Assistant Professor of Plant Breeding.
 Benjamin Dunbar Wilson, M. S., Ph. D., Assistant Professor of Soil Technology.
 Nancy Hill McNeal, Ph. B., Assistant Extension Professor of Home Economics.
 Emery N. Ferriss, Ph. B., M. A., Ph. D., Assistant Professor of Rural Education.
 Laurence Howland MacDaniels, A. B., Ph. D., Assistant Professor of Pomology.
 E. Laurence Palmer, M. A., Ph. D., Assistant Professor of Rural Education.
 Winifred Moses, B. S., Assistant Professor of Home Economics.
 Frederick Gardner Behrends, B. S., Assistant Extension Professor of Rural Engineering.
 Robert Morrill Adams, B. S., A. B., Assistant Extension Professor of Vegetable Gardening.
 Harry Wilmer Dye, M. S. A., Ph. D., Assistant Professor of Plant Pathology.
 Clarence Vernon Noble, B. S., Ph. D., Assistant Professor of Farm Management.
 Mrs. Jessie Austin Boys, M. S., Assistant Professor of Home Economics.
 Frank Latta Fairbanks, M. E., Assistant Professor of Rural Engineering.
 Harold Eugene Botsford, B. S., Assistant Extension Professor of Poultry Husbandry.
 Louis Michael Roehl, B. S., Assistant Professor of Farm Shop.
 Frances Beatrice Hunter, B. S., Assistant Professor of Home Economics.
 Alpheus Mansfield Goodman, B. S. A., Assistant Extension Professor of Rural Engineering.

Ellen Ann Reynolds, M. S., M. A., Assistant Professor of Home Economics.
 Millard Van Marter Atwood, A. B., Assistant Professor in Extension Service and Assistant Chief of Publications.
 Axel Ferdinand Gustafson, Ph. D., Assistant Extension Professor of Soil Technology.
 Gilbert Warren Peck, M. S., Assistant Extension Professor of Pomology.
 Arno Herbert Nehrling, Assistant Professor of Floriculture.
 Cedric Hay Guise, B. S., M. F., Assistant Professor of Forest Management.
 Howard Campbell Jackson, B. S., M. S. in Agr., Ph. D., Assistant Professor of Dairy Industry.
 Mortimer Demarest Leonard, B. S., Ph. D., Assistant Extension Professor of Entomology.
 Norman Damon Steve, B. S., Assistant Extension Professor of Rural Engineering.
 Flora Martha Thurston, B. S., Assistant Extension Professor of Home Economics.
 Robert B. Hinman, B. S., Assistant Professor of Animal Husbandry.
 Walter H. Burkholder, A. B., Ph. D., Assistant Professor of Plant Pathology.
 Doris Schumaker, B. S., Assistant Extension Professor of Home Economics.
 John Reiff Bechtel, M. S., Assistant Extension Professor of Vegetable Gardening.
 Ruth Kellogg, B. S., Acting Assistant Professor of Home Economics.
 Dora H. Wetherbee, Acting Assistant Professor of Home Economics.
 Godfrey Richard Hoerner, M. S., Assistant Extension Professor of Plant Pathology.
 Mrs. Ruby Green Smith, A. M., Ph. D., State Leader of Home Demonstration Agents.
 Esther L. Snook, B. S., Assistant State Leader of Home Demonstration Agents.
 Carolyn Morton, B. S., Assistant State Leader of Home Demonstration Agents.
 Emma Johnson, B. S. in Agr., Assistant State Leader of Junior Extension.
 Paul Rexford Young, B. S., Assistant State Leader of Junior Extension.
 Emmons William Leland, B. S. A., Experimentalist in Soil Technology.
 Frank Bonar Howe, A. B., Soil Surveyor.
 George Walter Tailby, jr., B. S. A., Extension Instructor in Animal Husbandry.
 Richard Alan Mordoff, B. S. in Agr., A. M., Instructor in Meteorology.
 Cass Ward Whitney, B. S., Extension Instructor in Rural Social Organization.
 Lua Alice Minns, B. S., M. S. in Agr., Instructor in Floriculture.
 Winfred Enos Ayres, Extension Instructor in Dairy Industry.
 Lewis Merwin Hurd, Extension Instructor in Poultry Husbandry.
 Frank Burkett Wann, A. B., Ph. D., Instructor in Botany.
 Clara Louise Garrett, B. S., Instructor in Drawing.
 Walter Gernet Krum, Extension Instructor in Poultry Husbandry.
 Laurence Joseph Norton, B. S., Instructor in Farm Management.
 Ralph Simpson Nanz, B. S., Instructor in Botany.
 Joseph Pullman Porter, B. S., M. S. A., M. L. D., Extension Instructor in Landscape Art.
 Lawrence Paul Wehrle, M. S., Research Instructor in Entomology.
 Ernest Charles Young, B. S., Extension Instructor in Farm Management.
 Charles Loring Allen, B. A., M. S. in Agr., Ph. D., Instructor in Animal Husbandry.
 George Haines, B. S., M. S. in Agr., Instructor in Animal Husbandry.
 Walter Housley Wellhouse, M. A., Ph. D., Instructor in Entomology.
 Paul Andrew Downs, M. S., Instructor in Dairy Industry.
 Robert Carroll Ogle, Extension Instructor in Poultry Husbandry.
 Warren B. Meixner, B. S., Instructor in Landscape Art.
 Leslie Ellsworth Card, B. S., Instructor in Poultry Husbandry.
 Alice May Blinn, B. S., Extension Instructor in Home Economics.
 Claude Willard Leister, B. S., Instructor in Ornithology.
 Walter Conrad Muenschner, A. M., Instructor in Botany.
 Florence Ethel Axtell, B. S., Instructor in Rural Education.
 Leon Augustus Hausman, A. M., Ph. D., Instructor in Biology.
 Mrs. Lolita Georgia, A. B., Instructor in Home Economics and Accounting.
 Mathilda Emilie Bertrams, Ph. B., Extension Instructor in Home Economics.
 Merle Perrott Moon, A. B., M. S., Instructor in Dairy Industry.
 Lowell Fitz Randolph, Ph. B., Instructor in Botany.

Percy Lawrence Dunn, B. S., Instructor in Extension Service.
Harold Arthur Pratt, B. S., M. S., Instructor in Floriculture.
Ronald Glenn Knapp, B. S., Instructor in Animal Husbandry.
Robert Stearns Kirby, M. S., Extension Instructor in Plant Pathology.
Irene French, Extension Instructor in Home Economics.
Ernest Dorsey, B. S., Instructor in Plant Breeding.
Leo Chandler Norris, B. S., Instructor in Animal Husbandry.
Eleanor Hillhouse, B. S., Instructor in Home Economics.
Margery Wheldon Leonard, A. B., Instructor in Plant Pathology.
Ruth Jakway, M. A., Instructor in Home Economics.
George Harold Rea, Extension Specialist in Apiculture.
Charles Kerr Sibley, B. S., Instructor in Limnology.
Van Breed Hart, B. S., Instructor in Farm Management.
Leland Eugene Weaver, B. S., Extension Instructor in Poultry Husbandry.
Austin Wertman William Sand, B. S., Instructor in Floriculture.
Howard Arthur Stevenson, B. S., Instructor in Extension Service.
Jennie Jones, Extension Instructor in Home Economics.
Harold Strycker Mills, B. S., Instructor in Vegetable Gardening.
Harry S. Gabriel, M. S., Instructor in Farm Management.
Leland Spencer, B. S., Instructor in Farm Management.
Herbert Press Cooper, M. S., Instructor in Field Crops.
Mrs. Adele Lewis Grant, B. S., M. A., Instructor in Botany.
Frank Ashmore Pearson, B. S. in Agr., Instructor in Agricultural Economics.
Edwin Earl Honey, B. S., Instructor in Plant Pathology.
Evelyn Ida Fernald, M. A., Instructor in Botany.
Clarence Edgar Lee, B. S., Instructor in Rural Education.
Ernest Edgar Pittman, B. S. in Agr., Instructor in Dairy Industry.
Harry Michael Francis, Instructor in Rural Engineering.
Anson Wright Gibson, B. S., Instructor in Farm Practice.
Luther Shirley West, B. S., Instructor in Parasitology.
John Levenus Buys, M. S., Instructor in Entomology.
Walter Van Price, B. S., M. S., Instructor in Dairy Industry.
Frank Dickson, B. A., Instructor in Plant Pathology.
Mrs. Carolyn Brundage McIlroy, Instructor in Home Economics and Shop Director.
Frances Artie Brookins, Instructor in Home Economics and Associate Shop Director.
William Theodore Grams, B. S. in Agr., Extension Instructor in Animal Husbandry.
Marion Fleming, M. A., Instructor in Home Economics and Supervisor of the Apartment.
Reed Pelton Travis, B. S., Instructor in Dairy Industry.
Roy Wallace Moore, B. S., Instructor in Agricultural Chemistry.
James Asher McConnell, B. S., Instructor in Animal Husbandry.
Raymond William Bell, B. S., M. S. in Agr., Instructor in Dairy Industry.
Donald Stuart Welch, B. S., Instructor in Plant Pathology.
Luther Clinton Kirkland, B. S., Instructor in Farm Practice.
Reena Roberts, B. S., M. A., Instructor in Home Economics.
C. Lois Farmer, B. S., Instructor in Institutional Management and Manager of Home Economics Cafeteria.
Alfred Cobaugh Lechler, B. S., Instructor in Extension Service.
Charles Edward Hunn, Assistant in Plant Propagation.
William Thomas Craig, Assistant in Cereal Investigations.
Walton I. Fisher, Assistant in Plant Breeding Investigations.
Harold Haydn Clum, A. B., Assistant in Botany.
Hazel Elisabeth Branch, M. A., Ph. D., Assistant in Biology.
Carl Louis Wilson, M. A., Assistant in Botany.
Merl Conrad Gillis, M. S., Assistant in Plant Breeding.
Mary Isabelle Potter, B. S., M. L. D., Assistant in Landscape Art.
Ellis Lore Kirkpatrick, B. S. A., Assistant in Rural Social Organization.
Eldon B. Engle, A. B., Assistant in Soil Technology.
Ruth Gladys Williams, M. A., Assistant in Botany.

Charles Henry Merchant, B. S., Assistant in Rural Economy.
Andrew Dillard Suttle, M. S., Assistant in Agronomy.
Lawrence Myron Fenner, B. S. A., Assistant in Plant Pathology.
Stewart Henry Burnham, B. S., Assistant in Botany.
Kathryn Slingerland, A. B., Assistant in Entomology.
Edward Louis Proebsting, B. S., Assistant in Botany.
Mrs. Ethel Hinckley Hausman, B. S., Assistant in Rural Education.
Daniel Francis Kinsman, B. S., Assistant in Soil Technology.
Paul Anthony Herbert, B. S., Assistant in Forestry.
William Burnet Apgar, B. S., Assistant in Forestry.
Hempstead Castle, B. S., Assistant in Botany.
Martin Norgore, B. S., Assistant in Entomology.
Raymond B. Cowles, A. B., Assistant in Biology.
Henry G. Good, B. S., Assistant in Biology.
Wayne E. Manning, A. B., Assistant in Botany.
Miles Hugo Cubbon, B. S., Assistant in Soil Technology.
Harold Raymond Curran, B. S., Assistant in Dairy Industry.
William Carroll Hollis, B. S., Assistant in Dairy Industry.
George Eric Peabody, B. S., Assistant in Extension Service.
Irene Thelma Dahlberg, B. S., Assistant in Home Economics.
Walter Earl Loomis, B. S., Assistant in Vegetable Gardening.
Freeman Smith Howlett, B. S., Assistant in Pomology.
Olin Whitney Smith, B. S., Assistant Secretary.
Willard Waldo Ellis, A. B., LL. B., Librarian.
George Wilson Parker, Managing Clerk.

ACTING PRESIDENT'S LETTER OF TRANSMITTAL

September 20, 1921

The Governor of the State of New York,
Albany, New York.

The Secretary of the Treasury,
Washington, D. C.

The Secretary of Agriculture,
Washington, D. C.

The Commissioner of Agriculture,
Albany, New York.

The Act of Congress, approved March 2, 1887, establishing Agricultural Experiment Stations in connection with the Land Grant Colleges, contains the following provision: "It shall be the duty of each of said stations, annually, on or before the first day of February, to make to the Governor of the State or Territory in which it is located, a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner of Agriculture, and to the Secretary of the Treasury of the United States."

And the Act of the Legislature of the State of New York, approved April 12, 1906, providing for the administration of the New York State College of Agriculture at Cornell University, contains the following provision: "The said University shall expend such moneys and use such property of the State in administering said College of Agriculture as above provided, and shall report to the Commissioner of Agriculture in each year on or before the first day of December, a detailed statement of such expenditures and of the general operations of the said College of Agriculture for the year ending the thirtieth day of September then next preceding."

In conformity with these laws I have the honor to submit herewith on behalf of Cornell University the report for the year 1920-21 of the New York State College of Agriculture and the Agricultural Experiment Station, signed by the Dean of that College and the Director of the Experiment Station, Mr. Albert R. Mann.

Early in the academic year 1920-21 it became necessary for Cornell University to consider the future heating of the state buildings on the

campus, that is, the State Colleges of Agriculture and Veterinary Medicine and the State Drill Hall. The state authorities proposed that the University should provide heating capacity and sell heat to the State for its buildings here. This the University agreed to do; and I submit herewith the following actions of the Board of Trustees of Cornell University which give a complete history of the development of a plant for the centralized heating of all buildings for instruction and administration on the university campus:

At a meeting of the Committee on Buildings and Grounds held September 24, 1920, the following action was taken:

As the result of a site survey the State Architect brought to the attention of the Buildings and Grounds Committee of the Board of Trustees of Cornell University the disadvantage of continuing the present power plant of the Agricultural College. Even if kept in its present position it will be necessary to add extensively to the present construction in order to supply adequate heat and power to the proposed development. At present it appears possible to utilize the site of the present power plant for the extensive construction of the proposed rural engineering activities, and it is possible that if given up as a power plant the present power plant construction could be incorporated as a portion of the proposed rural engineering building. Be it therefore

RESOLVED: That the State Architect is authorized to develop the plans for the rural engineering building on the site of, and adjacent to, the present power house and include in his plans such of the present structure as may be utilized for the activities of the Rural Engineering Department, and be it further

RESOLVED: That a recommendation be made by this Committee to the Trustees of Cornell University that such heat, light and power as may be necessary for the supply of the agricultural school be furnished and sold to the State from a central power and heating station, following the same procedure that is now in operation for the supply of heat, light and power by Cornell University to the State Drill Hall.

RESOLVED: That the Superintendent of Buildings and Grounds be requested to prepare, in order that it may accompany the recommendation to the Committee on General Administration, an estimate of the cost and the financial results of administration of a new complete heating plant designed to accommodate both the University and the State Colleges.

At a meeting of the Agricultural College Council held September 25, 1920, the following action was taken:

RESOLVED: That the Agricultural Council concur in the recommendation of the Buildings and Grounds Committee as to the erection of a central heating plant for the entire University, including the State Colleges.

At a meeting of the Committee on General Administration held October 2, 1920, the following action was taken:

The minutes of the Buildings Committee of September 24, 1920, were approved and the recommendations therein contained adopted, except as to paragraph 4, recommending the constructing of a central power and heating station by the University and the sale of the power and heat by the University to the State for the use of the State Colleges.

RESOLVED: That action on recommendation No. 4 of the Buildings and Grounds Committee be held in abeyance pending further information.

RESOLVED further: That the Agricultural College Council be requested to consider further and report on the policy of combining the interests of the State and of the University in a central heating plant, it being contemplated that the University shall erect and maintain the plant and sell the heat to the State.

That the Buildings Committee be requested to ask the State Architect to report upon a plan for a separate heating plant for the State Colleges, and the location and cost of such separate plant.

At a meeting of the Committee on Buildings and Grounds held November 12, 1920, the following action was taken:

RESOLVED: That the reports of the State Architect and of Henry R. Kent & Co. in regard to the heating plant be referred to the Agricultural College Council and the Board of Trustees with the information that the plan of a central heating plant for the whole University meets the approval of this Committee.

At a meeting of the Agricultural College Council held November 12, 1920, the following action was taken:

RESOLVED: That this Council join in the action of the Committee on Buildings and Grounds in approving the general studies and group plans showing the scope of the project developed to further the development of the College of Agriculture.

RESOLVED: That this Council approve in principle of the purchase of heat and power from Cornell University through the means of a central heating plant and recommend to the Board of Trustees of the University the adoption of a plan to that end.

At a meeting of the Board of Trustees held November 13, 1920, the following action was taken:

RESOLVED: That the report of the Committee on Buildings and Grounds in reference to a central heating plant for the University and the State Colleges be referred back to the Committee with the request that it continue its investigation of the matter as to plans and costs, and that a committee of five, to include the Chairman of the Finance Committee and the Chairman of the Administration Committee, be appointed to frame and recommend legislation to accomplish the consolidation of the heating plant of the University and the State Colleges and report. The Chairman appointed as members of this committee Trustees Sanderson, Blauvelt and Horace White (Chairman R. B. Williams, Finance Committee; Chairman VanCleaf, Committee on General Administration).

At a meeting of the Board of Trustees held January 8, 1921, the following action was taken :

It was referred to a committee consisting of the Acting President and Trustees Blauvelt and Edwards to consider and make recommendations as to the best method of procedure for the further study of the heating plants for the University and for the State Colleges and to report to the Committee on General Administration. The Committee on General Administration was authorized to make any appropriations deemed necessary.

At a meeting of the Committee on General Administration held April 2, 1921, the following action was taken :

The Special Committee consisting of Acting President Smith and Trustees Blauvelt and Edwards, to which was referred the matter of constructing a central heating system to supply heat for the buildings of the University to be served and the buildings of the State Colleges, submitted a report from Henry R. Kent & Co., dated April 2, 1921, relative to the construction cost and cost of maintenance and operation of such a system, from which report it appears among other things :

1. That a central heating plant may be constructed at or near the railroad station at East Ithaca sufficient to supply heat to the University as now served, the new chemistry building, the residential halls, Risley, Schoellkopf, the Agricultural College and one new building, and the Veterinary College, including a distributing system for all buildings to be served, except the State College, at an approximate cost of \$700,000.

2. That the cost of steam service with the existing plants enlarged to provide for the new chemistry building and one new Agricultural College building is stated at \$159,359; that the steam cost for the same buildings under the proposed new system is estimated at \$87,354, thereby reflecting a net saving in steam cost alone of \$72,005; that the annual cost of heat service with existing plants, including steam cost, amortization at the rate of 4 per cent, and interest at $7\frac{1}{2}$ per cent, is stated at \$192,479; that under the proposed new system, after paying interest at the rate of $7\frac{1}{2}$ per cent on the investment and providing for amortization at the rate of 4 per cent, the net saving under the two plans is estimated at \$23,625 :

RESOLVED: That the University construct a central heating plant at or near the railroad station at East Ithaca with a capacity sufficient to supply heat to the University as now served, the new chemistry building, the residential halls, Risley, Schoellkopf, the Agricultural College and one new building, and the Veterinary College, including a distributing system for all buildings to be served except the State Colleges, and that an appropriation of \$700,000, or so much thereof as is necessary, be made for the purpose.

RESOLVED further: That the matter be referred to the Committee on Buildings and Grounds for the purpose of preparing detailed plans and specifications for such new system, with power to employ an engineer or

engineers for the purpose. The said Committee shall so design the proposed new system as to permit of the addition from time to time of the installation of additional heating units at a minimum cost.

At a meeting of the Board of Trustees held April 30, 1921, the following action was taken:

The minutes of the meeting of the Committee on General Administration of April 2, 1921, were approved, and the action therein contained ratified and confirmed.

The following report of the Committee on Finance was approved and the recommendations therein contained adopted:

WHEREAS: The Committee on General Administration of the Board of Trustees at its meeting on April 2 took action authorizing the erection of a central heating plant at East Ithaca to supply heat with a few necessary exceptions to the University at Ithaca, including the New York State Drill Hall, the Schoellkopf Memorial Building, the New York State Agricultural College, and the New York State Veterinary College, and including a distributing system for all the buildings to be served except the State Colleges, at an approximate cost of \$700,000, and further referred the matter to this Committee for the purpose of preparing the plan for the financing of the proposition in a way to provide for the amortization of the construction cost within 20 years, and to provide for an equitable interest return upon the capital investment, now therefore be it

RESOLVED: That this Committee recommend to the Board of Trustees that the Comptroller be authorized from time to time as the work progresses upon proper certificate to make payment for the cost of the erection of said central heating plant to an amount not exceeding \$700,000.

That the money so advanced shall be considered and treated as an investment of a portion of the Cornell Endowment Fund.

That until the plant is completed and in operation the interest on such advances, unless other provision is made by the Trustees for meeting same, shall be included in the cost of the plant.

That the University in its several units, the State Colleges, the Athletic Association, the State for the Drill Hall, and any other units to which heat or steam may be furnished shall be charged for and required to pay at least annually the pro rata cost of the heat or steam so furnished, including overhead expenses, repairs, and alterations to the plant, together with a proportionate amortization allowance and equitable interest upon the University's investment.

The interest charge shall consist of interest upon the total cost of the plant. Of the amount so collected, the income of the University shall be credited with the interest upon the then existing balance of the University's advances, and any remaining interest together with an amortization charge of 4 per cent per annum upon the total cost of the plant shall be credited upon the moneys advanced by the University until the total advance is paid.

At a meeting of the Committee on Buildings and Grounds held on June 15, 1921, the following action was taken:

The Comptroller reported that he has transmitted to the State Architect a complete copy of all actions by the Board of Trustees relating to the construction of a central heating plant for the entire University and had received the following acknowledgment:

"State of New York,
Department of Architecture,
Albany, N. Y., May 23, 1921.

Charles D. Bostwick, *Secretary*,
Board of Trustees,
Cornell University,
Ithaca, N. Y.

My dear Mr. Bostwick: Upon my return from the quarantine survey in Italy I received your communication of May 11th containing a complete record of the University's action in regard to the construction of the Central Heating Plant for the entire University including the State Colleges.

I have, as you know, gone very thoroughly into this power proposition in connection with the development of the plan for the Agricultural School, and believe that the scheme finally approved for action by the University will fulfill all of the requirements of economy and efficiency. It is a workmanlike and far sighted undertaking.

With best regards,

Faithfully yours,

L. F. PILCHER,

State Architect."

May I in closing this letter of transmittal call attention to the importance to the State College of Agriculture, and hence to the farmers of the State of New York, of the carrying out as soon as possible of the building program for the development of the State College of Agriculture which was authorized by the Legislature of 1920, and which is described in detail on pages 22 to 25 of Dean Mann's report which follows this letter.

Respectfully submitted,

ALBERT W. SMITH,

Acting President of Cornell University.

REPORT OF THE NEW YORK STATE COLLEGE OF AGRICULTURE, 1920-21

To the Acting President of the University:

Sir: I have the honor to submit herewith a report of the work of the New York State College of Agriculture for the academic year 1920-21.

Enrollment of students

The registration figures for the College show little change from those of last year. The effect of the war remains evident in the abnormally small enrollment in the junior class, which entered in the fall of 1918. The numbers in the present freshman and sophomore classes are also somewhat below the pre-war level, indicating that other causes, important among which are the farm labor situation and the farmers' present economic plight, are operating to limit attendance. The large freshman class of last year contained a considerable number of students whose entrance had been delayed by reason of the war. The same is no doubt true of the winter courses.

Regular undergraduate students	1920-21	1919-20
Freshmen	351	414
Sophomores	319	247
Juniors	232	253
Seniors	240	302
	—1,142	—1,216
Special students	75	89
Winter-course students		
Agriculture (General)	156	231
Dairy Industry	43	55
Poultry Husbandry	37	48
Fruit Growing	24	22
Home Economics	39	21
Flower Growing	10	10
Vegetable Gardening	13	9
Game Farming	4	..
	— 326	— 396
Graduate students	215	229
Summer school students	530*	530*
	—	—
	2,288	2,460

*The same figures appear for the summer sessions of the two years, since that session is now counted as part of the following rather than of the preceding academic year, as was done in the tabulation published in last year's report. The enrollment in the summer school of 1921 (numbering, as this report is being written, the unexpected total of 926) will appear as belonging to the fiscal year of 1921-22.

Sources and objectives of the student body

Geographical. In spite of the fact that students who are not residents of the State of New York are held to pay a higher rate of tuition than is current in any other land-grant college in the United States, there have always been a large number of such students enrolled in the College. Ordinarily about 20 per cent of the undergraduates are from outside New York State, the lowest percentage being 15, in 1912-13, and the highest 23, in 1919-20. Their distribution is indicated in the following lists of States and countries from which the 278 non-resident students of the past year were enrolled:

Pennsylvania	52	Colorado	2
New Jersey	51	Kentucky	2
Ohio	20	Mississippi	2
Maryland	12	Missouri	2
Michigan	12	Montana	2
Washington, D. C.	11	Oklahoma	2
Massachusetts	10	Washington	2
Virginia	9	Alabama	1
Connecticut	7	Arkansas	1
Illinois	7	California	1
Iowa	5	Delaware	1
Texas	5	Indiana	1
Vermont	5	Kansas	1
Florida	3	Louisiana	1
Georgia	3	Maine	1
New Hampshire	3	Minnesota	1
Rhode Island	3	Nebraska	1
Tennessee	3	South Carolina	1
China	6	Armenia	1
South Africa	5	Central America	1
South America	3	England	1
Jugoslavia (including Serbia)	3	India	1
Denmark	2	Italy	1
Hawaii	2	Norway	1
Philippine Islands	2	Spain	1
Turkey	2		

Farm- and city-bred. To state accurately the proportion of students coming from city and country is a somewhat difficult matter, since the home address gives little indication of actual experience. A more nearly accurate statement may be made on the basis of the records of the Office of Farm Practice. That office investigates the actual farm experience of every male student upon admission, and gives training to students on the university farm or helps them to obtain farm employment elsewhere so that they may meet the college requirement in this respect before the

beginning of the senior year. The common farm operations are classified under thirteen headings, with a maximum of ten points credit in each. The student is required to present, before he may enter upon his senior year, forty points reasonably distributed in the list, and these forty points would correspond to a full year of farm work. The boy who has lived all of his life on the farm would, on entering college at the age of seventeen, be credited on the average with from forty to fifty points and would therefore not be held for further experience. The records show that during the past six years 32.9 per cent of the male students admitted had inadequate or no farm experience, 31.5 per cent were credited with from twenty to forty points, and 35.6 per cent were given forty or more points. The middle group, of course, includes some farm-reared boys who have not given full time to farm work during their summers previous to coming to college; and it includes, also, young men who have been engaged in some specialized line of agriculture, such as the florists' trade, seed trade, truck gardening, milk plants, and the like. The figures give no indication of significant change in respect to farm experience during the six years.

After-college employment of students. More difficult than, but fully as important as, determining the students' background of experience upon coming to college, is the task of finding out what occupations these students enter when they leave college and what measure of success they reach; but records complete enough to be of value are difficult and costly to obtain and their interpretation is not simple. The Alumni Association is cooperating with the Office of the Vice Dean and Secretary in making the alumni records more nearly accurate. The Office of Farm Practice is undertaking at the present time to make a thorough investigation of certain classes in order to obtain exact and dependable data. The information is needed, as the experience of its graduates must serve as a guide to the College in its work, and their increase in efficiency must be a measure of its own success.

Since its foundation, approximately 20,000 persons have enrolled for instruction in the College of Agriculture—a number too great and too widespread to be easily or frequently followed. Of this total, 6168 have been in the winter courses, and nearly all of these have gone into practical work, mostly in New York State. They will be found on farms in every part of the State, and in cheese factories, creameries, and related industries. About 4,588 have been enrolled in the six-weeks summer school, a large part of whom have been identified with educational work somewhere in the rural field. A total of 2,385 have been registered as postgraduates, and 7,298 have been enrolled as regular and special stu-

dents. It is from this group that the College must meet a dual obligation: to prepare some of this number to go directly into farming, and to prepare others to meet the demands for teachers, investigators, and highly trained specialists for all the fields of agriculture in government service and in industries relating to agriculture, leaders in farm organizations, county agricultural agents, and workers in highly technical or specialized private enterprises. There is no other institution provided by the State to train persons for the wide range of technical and professional positions of the first rank. The most rapid advance in agriculture in the interests of all the people will come from the work of these more highly trained men and women. They ultimately bring to State and Nation the largest return for the investment of public money made in them. If the figures were available for accurate measurement, they would probably show upward of one-half of the graduates of the full college course engaged in the vocations of agriculture, and most of the remainder in the higher specialized agricultural services.

In this connection it is important to note that a measure of success of a technical and professional college is, whether those who complete the work taken in the institution continue permanently in the field of work for which they have prepared themselves. The best available information indicates that approximately 86 per cent of all former students of the College of Agriculture are engaged in agricultural work—a record in which any institution might find gratification and encouragement. It completely answers the question as to whether the student who comes to the institution, enters with a bona fide intent to make agriculture his life work.

New York State Bankers' Association scholarships

For many years, the New York State Bankers' Association, chiefly through its Secretary, Mr. E. J. Gallion, and its Committee on Agriculture, has cooperated most helpfully with the College in promoting the junior extension, or boys' and girls' club work. During the past year, the Association gave further substantial evidence of its desire to encourage farm boys and girls to improve their agricultural practice by offering five scholarships, each in the amount of \$250, to cover railroad transportation and maintenance of five boys and girls who do the best junior extension work under rules laid down by the College of Agriculture, the scholarships to be available for the short winter courses given in the year 1921-22. These scholarships were donated by the present President of the State Association, Mr. S. G. H. Turner, President of the Second National Bank of Elmira, and the following four former

presidents of the State Association: Walter H. Bennett, Vice-President of the American Exchange National Bank of New York City, Henry C. Brewster, Chairman of the Board of the Traders' National Bank of Rochester, Lewis E. Pierson, Chairman of the Board of the Irving National Bank of New York City, and Robert H. Treman, President of the Tompkins County National Bank of Ithaca. Grateful acknowledgment is due these persons for their gifts to such a worthy purpose.

Changes in the staff

The year covered by this report witnessed the loss from the staff of the following valued teachers, who left to accept attractive posts elsewhere: E. G. Montgomery, Professor of Farm Crops and Head of Department; K. C. Livermore, Professor of Farm Management; E. O. Fippin, Extension Professor of Soil Technology; R. W. Rees, Extension Professor of Pomology; Lulu Graves, Professor of Home Economics; H. E. Thomas, Extension Assistant Professor of Plant Pathology; M. D. Butler, Extension Assistant Professor of Vegetable Gardening; David Lumsden, Assistant Professor of Floriculture; Bonnie E. Scholes, Extension Assistant Professor of Home Economics; F. E. Robertson, Assistant State Leader of County Agricultural Agents.

The following appointments have been made, effective during the past fiscal year: Dr. Orville G. Brim, Professor of Rural Education, in charge of rural elementary education; Dr. Theodore H. Eaton, formerly Professor of Agricultural Education in the Connecticut Agricultural College, Professor of Rural Education; Dr. C. E. Ladd, formerly Director of the New York State School of Agriculture at Alfred University, Professor of Farm Management; H. E. Babcock, Ph. B., formerly State Leader of County Agricultural Agents, Professor of Marketing; Dr. Doak B. Carrick, formerly of the Bureau of Markets, United States Department of Agriculture, Professor of Pomology; Gilbert W. Peck, M. S., formerly Agricultural Agent in Ontario County, Extension Assistant Professor of Pomology; Arno H. Nehrling, formerly head of the Department of Floriculture at the Massachusetts Agricultural College, Assistant Professor of Floriculture; E. A. Flansburgh, formerly County Agricultural Agent in Livingston County, Assistant State Leader of County Agricultural Agents.

On October 1, 1920, Professor A. J. Heinicke was promoted to the headship of the Department of Pomology.

At the Commencement meeting of the Board of Trustees, Dr. L. H. Bailey, the able and distinguished Director of this College for many years, who had retired in 1913, was elected Professor Emeritus. At the

same time Dr. W. H. Jordan, who for twenty-five years had directed the New York Agricultural Experiment Station at Geneva with conspicuous success and who held appointment to the staff of this College by reason of the affiliation of the State College and the State Experiment Station, was elected Professor of Animal Nutrition, Emeritus.

Dr. R. W. Thatcher, successor to Dr. Jordan as Director of the New York Agricultural Experiment Station, was elected Professor of Plant Chemistry in this College.

Changes in internal organization

A number of important changes in the internal organization of the College should be recorded.

On September 25, 1920, on the proposal of the Dean, the Agricultural College Council recommended to the Trustees the consolidation in the College of Agriculture of the instruction in botany now being given in the University, involving the transfer to the College of Agriculture of one professorship, and the transfer to the College of Arts and Sciences, Department of Chemistry, of the work in agricultural chemistry now being given in the College of Agriculture. At the same time the Dean called attention to the fact that the State Architect, in preparing plans for the development of the College of Agriculture, was providing space for work in zoology, pursuant to the action of the Trustees of January 15, 1915.

On November 12, 1920, on the proposal of the Dean, the Agricultural College Council recommended to the Trustees that there be transferred from the College of Agriculture to the College of Architecture the design and construction phases of landscape art as now existing in the former College, the College of Agriculture to retain responsibility for instruction in the selection, care, and use of plant materials in landscape design and in country planning, and for extension teaching in landscape art, that is, in the development of extension service for the improvement of country life by means of better planning of rural communities and of both public and private properties within them. In order to retain the necessary unity in the professional landscape work, it was agreed between the Deans of the two Colleges that it is desirable that the head of the landscape instruction, or his successor, in the College of Architecture, should retain his seat in the Faculty of Agriculture, and that the person in charge of plant materials of landscape design in the College of Agriculture should be given a seat in the Faculty of Architecture.

The foregoing proposals were made in the interest of better educational organization, in order to bring together within the University departments of instruction working in common subject-matter fields. The proposals

were approved by the Board of Trustees, the details as to time and manner of transfer being referred to the President with power.

On April 29, 1921, the Dean recommended to the Council that the Department of Farm Crops be discontinued as a separate department; that the crop-improvement and variety-testing work be transferred to the Department of Plant Breeding, already engaged in such work, and that the crop-production aspects be transferred to the Department of Soil Technology; that the latter department, because of its broadened functions, be renamed the Department of Agronomy and continued under the headship of Dr. T. L. Lyon. Experience had shown that, in the organization of the College, the field allotted to farm crops was so restricted as to adversely affect the development of the subject and the freedom of the teachers and investigators. The new arrangement effected is not entirely free from arbitrary allotment of services; collegiate departments seldom are. Under the existing departmentalization of the College, and the stage of development of the several subjects affected, the changes seemed to offer the largest promise of substantial gains and at the same time to meet the demands of logical organization.

Incident to these changes, it was further recommended that the Department of Vegetable Gardening, which at the outbreak of the World War had suffered almost complete loss of its staff and for administrative convenience had been temporarily joined to the Department of Farm Crops, be reestablished as a separate department. Professor H. C. Thompson was named head of the reestablished department.

All of these changes were approved by the council and confirmed by the Board of Trustees.

During the past year, the Trustees amended the statutes of the University so as to provide that the Dean of the New York State Veterinary College should be made a member of the Agricultural College Council, and the Dean of the New York State College of Agriculture be made a member of the Veterinary College Council. This association will undoubtedly prove beneficial to both Colleges, not alone because they have common problems as state institutions, but quite as much because they are both concerned with the livestock industries of the State. It should also help to assure in future the continuance of the cordial relations which have existed between the two Colleges.

The building program

Progress on the building development of the College, authorized by the Legislature of 1920, has been chiefly in four directions:

(1) On November 11, 1920, the State Architect presented to a joint meeting of the Agricultural College Council and the Committee on Buildings and Grounds of the Board of Trustees of Cornell University, studies, plans, and outlines, showing the character and scope of the contemplated additions to the College of Agriculture in respect both to classroom and to farm buildings, based on a detailed statement of the needs of the College filed with the Legislature of 1920. These comprehensive studies were approved by the joint conference, and were confirmed by the Trustees on the day following.

In addition to a detailed verbal explanation of the plans, the State Architect presented the following statement:

STATE OF NEW YORK
DEPARTMENT OF ARCHITECTURE
ALBANY

November 11, 1920

*Report Regarding General Status and Group Plans for Agricultural
Schools, Cornell University*

The general or group plan submitted herewith, presents the final results of the cooperative study between the State Architect and the Committee on Buildings and Grounds of the Board of Trustees, the Dean of the Agricultural School and members of the Faculty, and the Consulting Architect.

It is confidently believed that it represents practically the first attempt to develop a complete, comprehensive group plan of all the activities involved in Agricultural Education. It has been developed with a deep consciousness of the supreme importance to the American people of providing an institution broad, comprehensive, and complete in all its parts for education in this noble and fundamental calling. It has been visualized as a recognition on the part of the people of the State of New York that, if this Nation is to survive. Agriculture must be and continue as one of the most honorable, lucrative and inspiring of vocations, requiring the best of educational equipment, the most complete technical knowledge and practical experience. As a mold in which citizenship of high ideals must be cast, it has been my effort in this group of buildings to present something worthy of the calling of agriculture, a calling which from ancient times has been the foundation on which the prosperity and civic standing of all nations has been based and which has been so intimately interwoven into the lives of the people, forming in fact, an essential part of their religion as expressed in human terms.

The plan submitted to Governor Smith and the Legislature on which the present appropriation was based, has been developed with these ideals constantly in mind. The inspection trip of the big Agricultural Colleges of the Middle West at Urbana, Ill., Madison, Wis., St. Paul, Minn., Ames, Iowa, Lincoln, Neb., Lansing, Mich., etc., has confirmed the wisdom of the general design and composition of the group, emphasizing the soundness of the principle of planning in the great quadrangle. The generally scattered disposition of buildings in most of the institutions results in no outstanding or definite impression. At Lincoln alone is there any definite attempt at grouping, but not on any such comprehensive and coherent scale as in our group for the New York State College of Agriculture.

The combining of the remodeled Roberts and Stone Halls and Dairy Buildings with the Home Economics and Caldwell Hall and the new buildings for Plant Industry and Biology, Library, Museum and Assembly Hall to form this great Agricultural quadrangle has been worked out in detail and with some modifications of the original plan. The plan for these buildings, as herewith submitted, represents the results of the inspection trip.

The building for Rural Economics and Farm Management has been developed in accordance with the requirements of this most important department, and has been located as originally planned, forming with Forestry and the new Poultry building a subsidiary group with its own forecourt.

The Agricultural Engineering building, located upon the site of the old power plant, has been developed along lines determined by the character of the topography of this site and also as the result of conclusions drawn from the inspection trip above referred to. This particular building must in its mass accuse the industrial type of buildings necessary in this class of work. The building consists of two parts, a head house of class room and office type, basement and three stories high, and a one story industrial type shop building to provide for all the laboratory work connected with tractors, gas engines, blacksmith, and other work of a purely shop character. As located, the head house is reached from the main campus level at the grade of the third floor, and there are also grade entrances at the 1st floor level from the present road to the power house and entrances at the ground level for the shops and basement of the head house. A road will be brought from the farm buildings direct to the shops by joining to the existing roads, so that tractors and heavy machines will be kept off of the main roads of the campus. Thus the noise, dirt, and objectionable features of this highly important department will be removed from the main buildings and yet be readily accessible. An entrance from the state highway will be developed.

The Dairy building, located as in the original plan, has been developed along quite different lines from the primary part. As a result of the inspection trip and seeing many commercial plants, the Dairy building has been designed with a head house, basement and three stories high for class rooms, laboratories, lecture room, etc., and the entire student and manufacturing work of the dairy industry will be put in a one story type of industrial light and airy construction, employing the most modern, scientific, and sanitary equipment and materials.

1. Plant Industry—Pathology
2. Biology—Botany
3. Museum and Library
4. Agronomy—(Caldwell)
5. Home Economics
6. Rural Economics and Farm Management
7. Home Economics
8. Roberts Hall—Administration
9. Stone Hall—Old Dairy Building
10. Agricultural Engineering
11. Dairy
12. Forestry
13. Poultry
14. Farm operations, barns, etc.

Respectfully submitted,

(Signed) LEWIS F. PILCHER.

The following actions of the Committee on Buildings and Grounds and of the Board of Trustees of Cornell University were taken on the recommendation of the State Architect, and in compliance with the provisions of the Appropriation Act that the plans "be approved by the Trustees of said University, by or before December 1, 1920."

WHEREAS, As the result of a survey made of the needs of the College of Agriculture of Cornell University by L. F. Pilcher, State Architect, under the direction of the Governor of the State of New York and the Legislature of the State of New York, a report was made that a scheme of development should be carried out that would show the complete extension requiring the expenditure of approximately six million dollars; and

WHEREAS, In accordance with a group plan, prepared by the architect in consultation with the various faculties and officials of the University, the immediate betterment requirements of the Agricultural College were demonstrated, and upon these drawings the approximate estimate of cost of three million dollars was made by the State Architect; and

WHEREAS, An appropriation of \$500,000.00 was recommended to meet the probable costs of the betterment projects up to and including the first of July, 1921; and

WHEREAS, In order that the interests of the State might be conserved and the probable economy of the best construction market be taken advantage of, it was legislated that the general studies and group plans showing the scope of the project, should be completed and presented for the approval of the Trustees of Cornell University previous to December 1, 1920; and

WHEREAS, As the result of the intensive study of the requirements of the Agricultural College made with the various faculties and experts of the College and with the members of the Committee on Buildings and Grounds; and

WHEREAS, Further, in accordance with the comprehensive check and advice of the Consulting Architect, Mr. Albert L. Brockway of Syracuse, N. Y., the plans presented to the Trustees for their information and action on Thursday, November 11, 1920, having been approved by the Committee on Buildings and Grounds in the following resolution,

WHEREAS, Having received from the State Architect, Lewis F. Pilcher, the general studies and group plans showing the scope of the project developed by him with the advice of the Consulting Architect, Mr. Albert L. Brockway, of Syracuse, N. Y., to further the development of the State College of Agriculture at Cornell University, it is

RESOLVED, That these plans, as presented, be and hereby are approved, and it is further

RESOLVED, That the plans, as hereby approved, be and hereby are recommended to the Trustees of Cornell University for their approval.

NOW THEREFORE BE IT RESOLVED: That these plans be and hereby are approved in accordance with the requirements of Chapter 165 of the Laws of 1920, and the State Architect is hereby directed to further develop such portions of these plans for contract during the winter, as the Committee on Buildings and Grounds of Cornell University shall determine upon.

(2) The State Architect has studied at length the requirements of departments and the most logical and advantageous association of departments and lines of work. On the basis of detailed information gathered in person at the College, and from data submitted by departments, the Architect has completed a large perspective, in color, showing the arrangement and proposed design of all of the main buildings required, except the additions to home economics. The accomplishment of this design sets the whole program substantially forward, showing, as it does, just what is required, how the parts are to be related, and how the necessary buildings can most suitably be grouped on the land area available. The design reveals, on the part of the State Architect, a clear understanding

of the requirements of the work, and of the spirit and purpose, of the College. It is an excellent achievement.

(3) As soon as the block plan for the enlarged development of the College began to take shape, it became evident that the contemplated new dairy building should be put forward for construction first, as the new construction in the main quadrangle would necessitate the removal of the manufacturing wing of the old building. By the close of the fiscal year, the detailed plans for the new dairy building were approaching completion, with every expectation that bids could be called for by the middle of July.

(4) The problem of heating the buildings, particularly those to be erected, has received special attention during the year and has been carried to a satisfactory conclusion. The existing heating plant is located adjacent to the classroom buildings, and the soot from the stack is a constant annoyance. Furthermore, the location involves hauling the coal nearly a mile from the railroad siding, much of the time across the college campus. The site of the heating plant is imperatively needed for the new building for rural engineering. It is thought, also, that some of the construction in the building can be incorporated into the rural engineering building. The decision of the Trustees, therefore, after extended consideration of the matter in consultation with the State Architect, to erect a central heating plant for the entire University, including the State Colleges, and to sell heat by meter to the State Colleges, was a decision as wise as it was welcome. It will make for substantial economies both in construction and in operation.

On May 11, 1921, the Secretary of the Board of Trustees addressed a communication to the State Architect, finally reviewing the actions of the Trustees in the matter. This was acknowledged and approved by the State Architect. Copies of this correspondence are included in the President's report as a matter of record and in order that the Legislature and the executive officers of the State may have the complete statement.

The necessity for carrying out the enlarged building development without interruption cannot be urged too strongly. The College is in the utmost need of relief in all of its departments. It is now more than eleven years since a plan embodying most of the structures now contemplated was first presented to the Legislature, and the conditions have grown steadily worse.

Land for a biological field station

Cornell University enjoys exceptional advantages for studies in natural history. The past year has brought noteworthy additions to the facilities of the institution for biological science. On the recommendation of the

Dean, the Trustees purchased some twenty acres of swamp and marsh land adjacent to the southeast end of Cayuga Lake for a biological field station for the College of Agriculture. No more convenient or suitable site could have been found.

Shortly thereafter, Professor Jeremiah W. Jenks, of New York, formerly of Cornell University, gave to the University, for the purposes of the field station, a concrete, three-compartment boathouse and a lot on the lake shore, near the other property. This will be most useful in connection with studies on the biology and resources of Cayuga Lake.

In the late winter, Mr. Jared T. Newman, a trustee of the University, who by other generous acts has promoted the biological activities, presented to the University, as an adjunct to the biological station, an area of several acres of rocky woodland on the hillside directly across the lake road from the field station tract. Being entirely different in character and in fauna and flora from the swamp tract, the area makes a valuable addition. It will probably be retained mainly as a wild life preserve, although a permanent stream on it will be available for water cultural uses.

These acquisitions lay the foundation for a biological field station of exceptional value in connection with the University. When the building needs of the College were placed before the Legislature in 1920, there was included an item for a field station building. When this is provided, the areas will be intensively used. It is an attractive prospect for students of biology and agriculture.

Additions to the botanical and entomological collections

The botanical staff is sparing no efforts to add to its already large collections. During the year, more than 16,500 sheets were added to the herbarium. The most notable acquisition is the entire moss, hepatic, and lichen herbarium of Dr. J. K. Small, Curator of the Museum of the New York Botanical Gardens. This collection is particularly rich in sets from various specialists both at home and abroad, and it places at once the moss herbarium of the College on a research basis.

The herbarium of Mr. Stewart Burnham (about 60,000 specimens) has been deposited with the College for its use.

During the coming summer, a party under the leadership of the head of the Department of Botany will undertake an automobile collecting tour to the Pacific Coast, traveling at their own expense and making collections for the department herbarium.

During the year 1919-20, Dr. J. C. Bradley, Professor of Entomology and Curator of Invertebrate Zoology, conducted at his own expense

extended entomological explorations in South America. His excursion had the dual purpose of making collections and establishing helpful contacts with many of the leading institutions and workers in entomology in South America. The expedition was eminently successful in both respects, and the entomological interests of the United States and of this institution were greatly furthered thereby. Professor Bradley has placed the University and the State under great obligation to himself. On much of his trip he was accompanied by Dr. W. T. M. Forbes, of this institution, who contributed largely to the collections that were made.

The immensity of the collections were such that much time will yet be consumed before all will be mounted and identified. Enough has been done, however, to warrant the following report: There were collected about 10,000 specimens of Lepidoptera, representing between 2,000 and 3,000 species. Most of these have been mounted and identified. Of other insects collected, about 1,000 were mounted in the field and approximately 27,000 have been pinned since the expedition returned home. It is estimated that approximately 50,000 specimens yet remain to be mounted. The total number of specimens gathered will run somewhere from 90,000 to 100,000.

In addition, Dr. Bradley made considerable collections of wasps' nests and other examples of insect architecture. He obtained by gift or exchange 2,000 insect specimens from Dr. Carlos Reed, 2,000 from Alfredo Faz, 1,000 from the National Museum in Santiago, Chili, and 1,000 from the National Museum in Montevideo. Material yet to be received, but for which arrangements were completed, include collections from the Museu Palista in Sao Paulo and from the National Museum of Brazil in Rio de Janeiro, and a collection of ants of Argentina and their architecture from Dr. Carlos Bruch.

The experimental game farm

Chapter 747 of the Laws of 1917 appropriated \$15,000 "To provide for the acquisition of land for a game farm in Tompkins County for the conduct of practical experiments in and the giving of instruction on the breeding of game." The act called on the Trustees of Cornell University to organize and administer the farm as a part of the New York State College of Agriculture. The Trustees and officers of Cornell University undertook this charge in the confident expectation that the State desired to enter seriously upon a program of investigation and education for the highest permanent utilization of its wild life resources. The act was originated and its passage accomplished by persons and organizations interested in the preservation and the increase of the wild life of the

State. Sportsmen, nature lovers, and others interested in the production of game as a farm enterprise, joined in urging the establishment of this experimental farm. The work has now been discontinued, due to the failure of the Legislature of 1920 to provide funds for its maintenance.

The object. New York State maintains three game farms for the propagation of game, mostly pheasants, for restocking purposes. It established the game farm in connection with the State College of Agriculture, not to duplicate the work of any of these farms, but to do what none of them does or is equipped to do—study the whole problem of game production and preservation from a scientific standpoint; make investigations and researches into the problems of more rapid increase under conditions of control, the development of superior strains, and the breeding and rearing, and hence the preservation to mankind, of fast disappearing species; and, through courses of instruction, prepare young persons for the business of rearing game for economic profit, as a valuable addition to the food supply, or for liberation for the benefit of sportsmen, or prepare them for employment as managers of game preserves, for which there has long existed a demand for trained men.

What has been done by the experimental farm. The act of 1917 carried an appropriation for the purchase of land for the farm. Time was required to locate a suitable area containing the necessary acreage, wood cover, flowing stream, and general suitability for the purpose, convenient to the College. When an available tract of the right character was found, considerable difficulty was experienced in obtaining a clear title. It was May, 1918, before the purchase was finally consummated and the land available for occupancy.

The Legislature of 1918 appropriated \$10,615 for the purpose of engaging the necessary staff to organize the farm and make a beginning on the work, and to provide such facilities as would be immediately necessary. The College limited its askings rigidly, believing it was wise to begin slowly and gain experience, and anticipating the gradual and sustained growth of the enterprise as the work normally developed. The appropriation for the last fiscal year, 1920-21, was, therefore, for the entire enterprise, but \$14,686.

The plan laid out by the College was to begin with the game birds, and as soon as this work was well established to direct attention to other game animals, particularly fur-bearing animals. The stock assembled consisted of ring-necked, silver, golden, Amherst, Mongolian, and versicolor pheasants; mallard, pintail, and teal ducks; wood duck; Canada geese; California quail; bobwhite; and ruffed grouse. For hatching purposes, a considerable number of domestic fowls were obtained.

After the Legislature of 1918 had made an appropriation for operating expenses, it was inevitable that time should be consumed in getting together the persons required to inaugurate the work, and in building equipment, making duck ponds, repairing buildings on the farm, and the like. It was therefore not until 1919 that real experimental work could be undertaken. In the meanwhile broad plans of investigation had, however, been developed.

The investigations actually undertaken included studies on food problems under conditions of control, development of selected and pedigreed strains, breeding to increase egg production, methods of handling eggs for incubation, methods of artificial incubation so as to increase output, and the like. Pheasants had long been raised under control. Studies were made of more economical and larger-scale production. The ruffed grouse is the finest native game bird, and it is rapidly disappearing. No successful means has yet been developed for its artificial propagation. Two years of work had been done with this bird on the problems of artificial feeding, breeding, and rearing. A group of investigations had to do with determining the feasibility of rearing various species of waterfowl for liberation to restock the marshes of the State, which have long since become depleted. There are thousands of acres of marsh land in the State suitable for the rearing of wild ducks, on which at present no waterfowl are raised. With a rapidly diminishing supply of raw fur, fur-farming is bound to become an important specialized farm industry. It cannot be successfully entered upon until much progress has been made by investigation as to how to breed and rear desirable species under conditions of control.

Since the establishment of courses in game farming by the State College of Agriculture, more than one hundred students have taken some of the work, and a number have specialized to fit themselves as game farmers or game keepers.

The State's investment. Including purchase of the farm, the State had an investment of more than \$30,000 in the land, equipment, facilities, and supplies. In addition, considerable stock was given to the farm by members of the American Game Protective and Propagation Association. There is also the investment of operating expenses for three years, totaling a greater amount and represented by accumulated experience and progress in the investigations and the organization of the enterprise.

What the failure of appropriations means. As a result of the failure of the last Legislature to make a further appropriation, the work was brought to a close on June 30. The staff was dismissed, the stock was shipped to the other game farms by courtesy of the Conservation Com-

mission, the pedigreed strains will be lost, the experiments are dissipated, and the State's entire investment and accumulated experience has come substantially to naught. It was beyond the range of possibility that results of immediate practical value could be obtained in so difficult an enterprise in two and one-half years. The value of the enterprise cannot be judged by results in so brief a time, but by the wisdom of the planning. It is useless to undertake such difficult investigative work unless it is to be long continued. On the strength of the State's request that the University undertake this work, courses of instruction were announced, and students were invited who enrolled with the expectation of fitting themselves for game farming as a life work. Their instruction must be discontinued. During the spring of 1921, with no special advertising, 118 requests were received from prospective students for 1921-22. They have had to be turned away. Is it just to the students, to the University, or to the State's wild life interests, that this should be done?

In passing it should be noted that the Legislature of 1920 appointed by joint resolution a special committee to consider and define the State's program for the protection and development of forestry and wild life. This committee, whose report appears as part of the report of the State Conservation Commission for the year 1920, discusses the wild life problem at length and specifically recommends to the Legislature the continuance and enlargement of the experimental game work being done by the State at the State College of Agriculture. Despite the recommendation of its own specially created committee, the Legislature failed to maintain the existing organization for the work.

The State must seek to place its protective and promotional activities on a scientific basis. This is the shortest cut to sound economy. New York, in common with the other States, has spent, and is destined to continue to spend, vast sums in the aggregate for the preservation of its native wild bird and animal life. Nature has given man its richest material possessions. Not only must these gifts not be lost through neglect, but they must increasingly be utilized for man's economic and social well-being. Fundamental to sound, speedy, and economical progress in this important field is adequate provision for research and education.

A program of forest and wild life conservation

The Legislature at its 1920 session adopted a concurrent resolution instructing the four state agencies chiefly concerned in the conservation of forests and wild life to formulate a program of conservation which should assign to each of them its sphere of activity. The text of the resolution follows:

RESOLVED, That the Conservation Commissioner, the Dean of the New York State College of Agriculture at Cornell University, the Dean of the New York State College of Forestry at Syracuse University, and the Director of the New York State Museum be and they hereby are directed to prepare an administrative and educational program for forest and wild life conservation, under which the respective spheres of activity of each institution shall be defined and delimited, and the basis of cooperation between them formulated; and to transmit this program to the Legislature at its next session as a part of the Annual Report of the Conservation Commission.

The complete report of the Committee was submitted to the Legislature in the Tenth Annual Report, for the year 1920, of the State Conservation Commission, pages 279-319. It deals at length with the problems referred to in the resolution, outlines the respective spheres of the several agencies, describing their proper functions and services, and makes recommendations for adjustments where specific conflicts have existed. Attention is respectfully called to this important statement.

In its conclusions and recommendations, the Committee defines the functions and responsibilities of the New York State College of Agriculture at Cornell University as follows:

In accordance with the laws defining its work, the State College of Agriculture through its appropriate departments should conduct collegiate instruction, research, and educational extension in forestry and in game farming, fish culture, and subjects dealing with wild life in general, including aquatic life, as phases of agriculture and as functions of the biological establishment which the State has provided at Ithaca. The teaching of forestry coordinate with the teaching in other departments of instruction in the College, is recognized as a necessary and integral part of its work as a college of agriculture.

In explanation and amplification of the foregoing conclusions, the report makes the following detailed statement concerning the New York State College of Agriculture at Cornell University:

The function of the New York State College of Agriculture at Cornell University is, with reference to the questions under discussion,

(1) To conduct teaching, research, and extension in forestry as a phase of agriculture, in accordance with the terms of the Administration Act of the College (Chapter 218, Laws of New York 1906) and of the Land-Grant Act of 1862.

(2) To conduct teaching, research, and extension in biology, the science of plant and animal life, including its subordinate branches:

(a) Game farming and wild life conservation, in accordance with special authorization therefor (Chapter 747, Laws of 1917).

(b) Fish culture, on the basis of its organization for this work definitely established as a phase of biology in 1906 and gradually developed as a regular part of the work of the College since that date. (Chapter 218, Laws of New York 1906; Land-Grant Act of 1862).

The work in forestry

The teaching of forestry. Agriculture is the raising of products from the land. The State College of Agriculture approaches forestry from the standpoint of agriculture. The forest is a crop, differing from other crops in the details of its handling, but not in its essential features. The teaching of forestry is an integral part of a fully developed college of agriculture, using the word agriculture in the broad sense in which it has long since been applied in colleges of agriculture

throughout the United States, in agricultural experiment stations and in the United States Department of Agriculture of which the National Forest Service is a component part, along with plant industry, animal husbandry, and the like. The forest crop is produced partly on farms and partly in segregated areas or so-called forest regions. Of approximately 14,000,000 acres in forest areas in New York State, 4,600,000 acres are in the Adirondack forest region, 1,200,000 acres are in the Catskill forest region, 4,100,000 acres are in farm woodlots, and the other large areas best suited for a forest crop, approximating 5,000,000 acres, are on lands now or previously largely enclosed within farm boundaries. According to the census of 1910, New York held second rank among the states of the Union in the value of farm forest products, producing more than one-twentieth of the total farm forest products reported in that year.

We have come to speak of farm forestry. There is, of course, no such thing as farm forestry except as a designation of place where the work may be done. The management of a forest tract, whether on a farm or in a segregated forest region, involves the application of the general principles and practices of good forestry—the principles embodied in professional forestry. The general principles of forestry must be applied to the farm forests. Failure to recognize this fact fully, and the tendency to assume that the care of the farm forest is a superficial sort of undertaking, is responsible in part for the neglect and consequent unproductive condition of one-third to one-half of the State's entire present and prospective forest area which is now within the confines of farms. It is not necessary that the prospective farmer should have full professional training in forestry. He should receive instruction in the general principles and practices of forest operation and development as he does in other farm operations; but there should also be opportunity for those who desire to train themselves fully in this line.

The State College of Agriculture is prepared to meet the following three forestry needs: the giving of full professional training, the giving of limited particularized training, and the giving of informational courses for the general student. In the College of Agriculture the whole subject has been developed from the agricultural viewpoint to meet the necessity of making the instruction substantial. This instruction must be handled by professionally trained foresters. The opportunity to give full collegiate work retains on the university faculty men of the training and ability required to give good instruction to university students. To provide for this work the State Legislature by specific act has provided a forestry building and the necessary equipment. Facilities are now available at the college for the adequate instruction of professional forestry students to a number that is not likely for some time to come to tax the physical capacity of the department.

It may be pointed out in passing that full collegiate forestry courses are now developed in the land-grant institutions in California, Minnesota, Washington, Michigan, and others as well as in New York. The beginning in New York was made in 1898, with the establishment of the New York State College of Forestry at Cornell University. At that time, the instruction in agriculture was maintained chiefly on the private endowments and federal grants of the University. Through failure of the State to make an appropriation therefor, the State College of Forestry ceased to function in 1903. The year following, however, the State created the New York State College of Agriculture at Cornell University, and in 1910 forestry was established as a department of instruction therein.

Forestry in the State College of Agriculture ranks in place and opportunity coordinate with other fields of instruction. In an institution for the higher education, such as Cornell University, all instruction must be of university grade or standards; otherwise it would not be tolerated. In every department of instruction there must be opportunity for specialization, for advanced and post-graduate study. The opportunity to do advanced work in each department of instruction is inherent in the university organization. The institution must offer students desiring to pursue any phase of the broad field of agriculture the opportunity to follow that subject to the best and fullest advantage. Cornell recognizes this obligation as regards forestry by conferring the degree of master in forestry on the completion of the five-year professional course, the degree of bachelor of science being given at the end of the fourth year.

In teaching the economics of agriculture and the problems of farm management,

both of which are of outstanding importance in the curricula of colleges of agriculture, the forest areas must be considered as part of the agricultural or farm domain. Forest cropping is as essential a part of the instruction as animal husbandry or fruit-tree growing. These agricultural subjects interlock. They are alike necessary to complete and rounded instruction in agriculture.

The point of view at Cornell is that the study of forestry is to be approached from the side of crop production and the best permanent use of the land; that essentially the forester's job is the raising, caring for, and harvesting of successive crops of timber and other forest products; that forestry is primarily a land problem.

Under the existing organization in the State College of Agriculture the staff necessary to meet the forestry requirements of instruction in agriculture is able also to give the necessary advanced and post-graduate instruction in professional forestry. To teach forestry in the State College of Agriculture requires but comparatively small additional financial outlay, as is revealed by the appropriation for this institution. (Total state appropriation for salaries and maintenance of the Department of Forestry, exclusive of heat, light, and water, which are included in general college appropriations, is \$29,110.00 for 1920-21.)

Professional education in forestry requires, among other things, basic instruction in botany, meteorology, biology, plant physiology, zoology, entomology, plant pathology, surveying, and soil technology. In the State College of Agriculture all of these subjects are already highly developed for the students in general agriculture and so do not need to be duplicated for the students in forestry. The existing arrangements make it possible for the forestry students in the State College of Agriculture to work under teachers of established reputation; and the facilities are already available for the training of specialists in such fields as forest entomology and forest pathology.

With the growing realization of the importance of the farm woodlot, resulting from the educational extension in cooperation with the farm bureaus, there promises to develop a demand for professional foresters who have specialized on the problems of the farm woodlot. The State College of Agriculture is particularly well fitted to meet this need.

Research in forestry. Research and teaching are correlated and interdependent and cannot be separated in college or university organization. Research may thrive alone, but good university teaching cannot thrive apart from research. It is impossible to segregate fine scholarship from research. The educational institutions the world over have been the chief sources of advance in scientific endeavor. Their range of investigation has been as wide as the limits of learning. It is impossible long to maintain any department on a university basis if research is lacking. To advance in knowledge is indispensable. The universities must train creative minds, and they can do this only when their teachers engage in creative work, that is, in scientific research. No educational institution can hold a place of leadership unless it is constantly advancing into new ranges and widening the boundaries of knowledge.

No hard and fast line can be drawn between the acquisition of new knowledge, which is research, and its dissemination, which is teaching. Post-graduate students as part of their required training undertake investigations into new fields of knowledge.

Extension in forestry. Agricultural extension work had its beginnings in this country in the nineties of the last century at the College of Agriculture at Cornell University. Beginning in the nineties and continuing until the establishment of the State College of Agriculture, the Legislature made special annual appropriations to the College for this purpose. In the Administration Act of 1906, extension teaching was defined as one of the three coordinate lines of work to be undertaken by the New York State College of Agriculture. Since that time there has been large development of the extension service of the College. In 1914, the Federal Congress passed the Smith-Lever Act establishing cooperative agricultural extension work with the land-grant institutions,—Cornell University is the land-grant institution in New York State,—which provides gradually increasing appropriations of federal monies to be offset by the states, the minimum of which for New York State, on and after 1923, will approximate \$330,000 annually, about \$170,000 coming from the Federal Congress and at least \$160,000 from the State. Under the terms

of state and federal laws this money is applied to the extension service of the State College of Agriculture at Cornell University. On the basis of this law there is a signed agreement between the Secretary of Agriculture and the President of Cornell University providing for cooperation in the extension activities of the United States Department of Agriculture (which includes the Forest Service) and the State College of Agriculture, the administrative officer of the joint work in the State being the Director of Extension who is the Dean of the State College of Agriculture. On the basis of these funds and under the terms of the agreement with the Secretary of Agriculture, and as a phase of the Cooperative Extension Service, there have been placed in fifty-five counties (the agricultural counties) in New York, one or more county agents for the promotion of the agriculture of the counties. Subject-matter extension specialists in farm crops, animal husbandry, forestry, and all other departments of the State College of Agriculture conduct their extension work through and in cooperation with these county agents. This vast and highly efficient organization, supported by the consolidation of the State College and Federal Department extension forces, provides incomparable machinery for the promotion of extension in the whole field of agriculture and country life.

The educational extension in forestry now proceeding from the Department of Forestry in the State College of Agriculture includes, among other things, instruction in forest planting; cleaning and thinnings in immature woodlands; improvement cuttings on more mature woodlands; assistance and demonstrations in the management of woodlands; the furnishing of information on methods of appraisal of woodlands and the profitable disposal of timber and other forest products, such as maple sirup and sugar; the reforestation of non-agricultural lands within the boundaries of farms. The development of forests on the non-agricultural areas on farms is the particular sphere of forestry as a phase of extension teaching. The extension education seeks also to create an intelligent public opinion with reference to the importance of adequately safeguarding the timber supply.

The work in biology, including wild life conservation

Biology, which is the science of life, plant and animal, is fundamental to all agricultural teaching and reasearch. It embraces the whole field of living things. The various acts under which the New York State College of Agriculture exists, and the broad field in which it functions, have made necessary the development of effective facilities for work in biology, of which wild life conservation is one of the important branches.

It would be impossible to train men and women for all of the manifold phases of agriculture without ability to impart a sound foundation in biology. Problems of biology touch farm life at literally hundreds of points. The selection, care, and breeding of domestic stock involve biology. If this stock is to be improved by the addition of wild strains, we are taken out of the domestic field and into that of the wild. The growing of crops is influenced by animal and insect pests. These in turn are often held in check by birds or wild animals, and thus on the farm we find it of the utmost necessity to conserve many desirable species for the preservation of agriculture itself. Many forms of wild life upon the farm, or capable of being developed there, can be made to provide an important revenue. Thus a well rounded college of agriculture must study and give instruction in all these fields. Furthermore, all plants and animals now under cultivation were derived from the wild state; and nature has not yet exhausted her contributions to the needs of mankind. Her further gifts must be continually sought.

As these subjects are followed out into their various ramifications, new fields for specialization are opened, which invite the most intensive work of experts. The College must accordingly provide courses for the training of men who are to devote their lives primarily to a single branch of biological knowledge, such as entomology, fish culture, or any of the many subdivisions of zoology.

The New York State College of Agriculture has endeavored to meet the obligations imposed upon it in this field. Its equipment for biological research, teaching and extension is unsurpassed, and the personnel of its faculty is as strong as any to be found in this country. For years it has turned out men who have taken

high rank in the practical application of biological principles and the development of new knowledge.

As the subject of conservation of wild life assumed increasing importance, principally within the last ten years, the College was able, because of its existing equipment, to devote special attention to it, and to be among the first institutions to initiate special courses in conservation. With the machinery and personnel already developed, it thus had practically no additional expense. The curriculum furnishes the scientific training essential to those who plan to make conservation their life work, and the courses regularly offered permit specialization in many directions. A four-year course leads to the degree of bachelor of science. A shorter course is designated for the training of those who wish to take up game protection or become keepers of game preserves or game farmers.

The facilities for research, without which such courses could not have been developed to the high plane which they have attained, are equally strong, and offer the means for solving many of the State's still unanswered questions of wild life conservation.

The work in game farming. By Chapter 747 of the Laws of 1917, there was established at Cornell University, as part of the State College of Agriculture, and as an outgrowth of the work already developed, a state experimental game farm for the purpose of conducting investigations in the breeding and rearing of game and the giving of instruction in the same. The State has since invested approximately \$30,000 in facilities and has provided a staff and operating expenses for the work. The function of this experimental game farm is to conduct experiments in the propagation and management of game birds and mammals for food, fur, and sport. Seven specific investigational projects are now under way, which are basic in game breeding and rearing. They embrace problems in the selection of feeds; studies in heredity; the establishment of pedigreed strains; artificial hatching to multiply rate of reproduction; artificial rearing, including feeds and appliances; special feeding of selected breeding stock; and other studies in propagation. Incidental to the experimental work surplus stock is obtained, which is placed at the disposal of the State Conservation Commission, which cooperates in the work, for distribution. Provision is also made for public lectures, demonstrations, exhibits, field visits, and publications to make known to the public the results of experimental work on the game farm.

Game farming is conducted with economy at the State College of Agriculture because a large part of the necessary instruction in fundamental and applied biological science is already available as part of the agricultural curriculum: zoology, botany, entomology, physiology, bacteriology, chemistry, embryology, histology, mammalogy, ornithology, limnology, forestry, fish culture, farm management, animal husbandry, genetics, farm crops, and, in poultry husbandry, such subjects as incubation, brooding, diseases, sanitation, feeding, breeding, and housing. With the high development of the work in the broad fields of biology and poultry husbandry; with research specialists already on salary with work long under way; with excellent general and technical libraries containing the accumulations of a half century in these related fields; and with a farm already purchased by the State which provides superior advantages as regards shelter, quality of the soil, slope of the land, natural cover, air and water drainage, abundant vegetative and insect life, and perpetual streams of pure water, the opportunities for a high development of the fields of game farming and wild life conservation are unexcelled. In the field of resident instruction, more than one hundred students have taken courses in game farming during the past three years.

As the Federal Biological Survey is coordinate with other units in the United States Department of Agriculture, so are the biological activities involved in game breeding and rearing and fish culture coordinate with other activities in the State College of Agriculture.

The work in fish culture. New York State possesses exceptional water conditions for successful fish raising. When one considers all of the streams, springs, and swamp lands now going to waste so far as food production is concerned he wonders why the State has not heretofore undertaken the intensive study of these natural resources. Furthermore, there are few farms which do not have enough water of the right quality to supply one or more fish ponds. Calls which have come to the

State College for years have indicated that large numbers of farmers will undertake the propagation of fishes just as soon as information of the right sort can be given them. There is also a demand among students of agriculture for instruction in practical fish culture.

Before fish production can be materially increased, careful investigations must be undertaken for the following purposes:

(1) Devising methods for increasing the productiveness of our public waters. This problem is of national interest. In our own State it has been quite generally discussed among fishing club members and in the meetings of the New York State Fish, Game and Forest League. The general opinion strongly favors scientific investigation of our streams and lakes with the idea of improving them from the fisherman's standpoint.

(2) Improving wild fishes by selective breeding. Fishes are susceptible to the same improvement as were the wild cattle, wild horses, and the jungle fowl. Enough of this selective breeding has been accomplished with the carp to prove the assertion. Breeding of improved cultural varieties of our better native fishes offers a most promising field.

(3) Devising methods for rearing fishes economically to marketable size. This has not yet been done in America except by trout breeders and even they must obtain high prices for their products to make the investment pay. The chief problem here concerned is that relating to food. As soon as natural food can be propagated economically, it will be possible to reduce the price of trout. This likewise applies to any fish reared in the farm pond. The existing fish hatcheries raise fry. The raising of mature fish economically waits on the solution of the feeding problem and problems in fish pond management.

(4) The study of fish diseases, their prevention and their cure. It has been found lately that large numbers of wild fishes as well as those raised in hatcheries are afflicted with various diseases, including goiter and others of parasitic origin. Methods for preventing these must be created, if we are to get clean and wholesome fish in the future and if fish are to be raised in domestication.

In 1911 applied work in aquiculture was established, both teaching and research, and a small experimental hatchery was built in Cascadilla Gorge. A large amount of investigation has been done there to test the relative value of various artificial fish foods, and one bit of this work won for the investigator in charge last year the first prize of the American Fisheries Society for the best work in fish culture.

Reasons why the fish cultural work and studies in aquatic life should be extended at Cornell University include the following:

(1) The State has already a considerable investment in work that is now yielding returns. Aside from the staff of specialists and the biological field laboratory at the head of the lake, with an additional lot and boat house on the shore, the existing equipment consists of a fireproof experimental hatchery in Cascadilla Gorge, a large fish cultural experiment station building on Cascadilla Creek on the college farm, rowboats, seines, and other collecting apparatus, equipment for raising aquatic organisms, equipment for sampling wet soils and soil waters, and laboratory apparatus in limnology and aquiculture as well as highly developed facilities in the broad fields of zoology, entomology, and biology.

(2) The location at Ithaca is exceptionally fine for work because of two conditions:

(a) The natural environment, with every sort of fresh water from farm streams and marshes to deep lake water. The college farms are abundantly supplied with fresh water streams.

(b) The presence of experts in all related fields, whose knowledge and advice may be obtained when needed and without additional expense.

(3) The ownership of field station property.

(4) The ownership of twenty acres of land at the head of Cayuga Lake which is unexcelled for the development of the enterprise.

(5) The existence at the College of a laboratory of parasitology for the study of fish parasites.

(6) The existence of a state-wide extension teaching system to show the owners

of many thousands of acres of waste wet land how to make some of this land more productive than by draining and at less cost.

Relations with the State Experiment Station

In the annual report of last year, a statement was made of the affiliation with the New York Agricultural Experiment Station at Geneva. The benefits of the affiliation have already been felt, and additional steps have been taken during the year to make the affiliation helpful and effective. Members of the station staff have been in frequent conference with members of the college staff working in cognate fields. They have taken part in the seminars with advanced students. They have advised helpfully with graduate students, and in other ways have lent valuable aid to the College. Members of the college staff and some of the advanced students have had occasion to avail themselves of the privilege of using facilities of the state station. The College has also availed itself of the invitation to procure much of the laboratory material for the course in fruit varieties from the Geneva station, where the supplies are exceptionally rich.

On the other hand, the faculty of the Graduate School at Cornell University has altered some of its regulations so as to make it possible for young men in the employ of the state station, engaged in research under the supervision of affiliated members of the station staff, to register for advanced degrees in the University more advantageously than students who may desire to do part of their graduate work away from Ithaca elsewhere. There is a ruling of the graduate faculty, rigidly adhered to, that a student who finds facilities for research in some laboratory away from the University, may, on the recommendation of his committee, be granted permission to receive residence credit during one year for work done in such a laboratory, provided, however, that he shall receive no compensation from the owners of the laboratory, and that he shall have been in residence at the University for at least two terms prior to the granting of the privilege. The faculty waived the first of these provisos in the interest of the employed assistants at the New York Experiment Station. They may now draw their salaries from that institution while receiving residence credit here, but, like assistants in the University, may receive only three-fourths residence credit. With respect to the second provision, it also has been waived in the specific instances of two assistants at Geneva who had had a year of postgraduate study at another university but had no residence at Cornell prior to their applications to be allowed credit for work to be undertaken at once at Geneva. While this second provision is still operative, these actions of the graduate faculty indicate that it will be enforced only in the interest of sound graduate work. Members

of the Geneva staff who are also members of the faculty of the State College of Agriculture may serve on the committees of graduate students for either major or minor subjects. However, in order that the Dean of the Graduate School may keep in close touch with graduate students, it has been provided that a member of the faculty resident in Ithaca must also be on the committee for each subject and directly responsible to the Graduate School for the student's work in that subject. Under this arrangement, considerable direction of the graduate student's work can be given by an affiliated staff member located at Geneva.

The affiliation should prove increasingly intimate and helpful as time goes on. The agriculture of the State needs for its best development the largest service of both institutions.

The policy of the College with respect to commercial cooperative organizations

With the rapid rise of farmers' cooperative organizations for commercial purposes, the question arose as to what should be the policy of the College, as a state institution, toward the organization and operation of such agencies. The College is instructed by law to undertake such work, of an educational character, as shall "improve the agricultural methods of the State" and as shall aid "in determining better methods of handling and marketing such [farm] products." It is necessary, therefore, that the College recognize the dominant interest of farmers at the present time in cooperative or combined buying and selling, and that it be in a position to advise wisely in this important movement, having in mind the general public interest.

At the request of the Trustees, a committee of the staff was appointed to draft a statement of college policy in this matter. After thorough consideration, the following statement of policy was presented to the Trustees and approved by them:

The staff of the New York State College of Agriculture believes that cooperation when wisely developed will result in savings which benefit both the producer and the consumer. Therefore, as an educational institution supported by public funds to assist in the development of agriculture in the interest of the whole people, it is clearly a duty of the College to teach farmers the fundamental principles and practices in cooperation including:

1. Information as to the principles involved in true cooperation.
2. Advice as to best methods of financing.
3. Advice as to the producing or selecting of standardized products.
4. Aid on the problems connected with grading, packing, storage, transportation, and the like.
5. Assistance in determining costs.

Members of the staff, in so far as precedent in universities is concerned, have the right to hold offices in other organizations if their service to the university is not thus impaired. However, in the interest both of the College and of the organizations, we believe that it is not advisable for a member of the college staff to hold any office or be a director in a commercial cooperative association.

The School of Home Economics

Home economics was established as an extension enterprise in the College of Agriculture at Cornell University in 1900, twenty-one years ago. When the State established the State College of Agriculture in 1904 and assumed its support, it included the work in home economics. In 1907, in the further organization of the rapidly developing work of the College, the Trustees organized the work in home economics as a separate department of instruction in the College. In 1911 the State Legislature made an appropriation of \$154,000 for a home economics building, and subsequently authorized \$20,000 more for initial equipment. The State has continued to maintain and develop the work since that time.

The expenditure of public moneys in this work in connection with the University during the past year exceeded a quarter of a million dollars, distributed as follows:

State appropriations for resident and extension work..	\$90,730
Federal Smith-Lever funds for extension	57,066
Federal Smith-Hughes funds for teacher training	2,150
<hr/>	
Total	\$149,946

To these funds must be added the following, which are appropriated specifically for the purpose of cooperating with the State College of Agriculture in the extension service in home economics:

State Department of Farms and Markets	\$18,000
Appropriations of county boards of supervisors for county home bureau work for 1921	94,294
Voluntary contributions by rural women through membership fees in county home bureau associations, 1921	22,486
Federal States Relations Service funds	3,444
<hr/>	
Total cooperative funds for extension teaching	\$138,224

Grand total of funds available in 1920-21 for the resident and extension work in home economics which Cornell University administers wholly or in part.. \$288,170

This is in addition to funds for heat, light, and water, and for printing bulletins and reports, which are undivided funds in the office of administration.

The staff now consists of seven professors, eleven assistant professors, fourteen instructors, and five officers in the administration of the home

bureau, junior extension, and related work, aside from the necessary clerical and other workers.

The enrollment of students taking the four-years course in home economics during the year 1920-21 was 271. General agricultural and other university students electing courses in home economics numbered 37. In the 1920-21 winter course, 39 were enrolled. In the 1921 summer school, 112 were registered. In all, 459 students received instruction in home economics during the year.

The teaching of home economics as a collegiate subject is yet relatively new, and it is still occasionally subject to the questionings which from the foundation of higher education have always been the lot of new departments of knowledge seeking entrance to the province of the universities for their fullest development and claiming public support. It is to be recalled that courses in science, now completely accepted, were developed in the older colleges as a grudging concession to the value of scientific work in a general cultural education. Because of its lack of traditional acceptance, it is as easy to disparage the art of costume design, the selection of textiles, and the care and feeding of human beings, as it was only a brief while ago to disparage the art of housing design, the selection of materials of building or machine construction, or the life habits of animal species. It is yet difficult to overcome the suspicion that because the art of costume design, for example, is finally made effective by the application of sewing and millinery, it is essentially of lower cast than the art of building design which is made effective for human use by the application of carpentry and masonry, or the art of machine design which is finally expressed in blacksmithing and forging and other mechanical operations. Subjects which involve somewhere in their teaching or application simple mechanical routine have always been met with doubt or rebuff when first they asked for a fair opportunity in the educational system.

The chemistry, utility, and reactions of foods are quite as scientific problems and as important to mankind as the chemistry, utility, and reactions of drugs; only we have been slow in realizing the fact. The training of dietitians of a highly expert character will never be accomplished in any educational system of less than college grade. With the development of physical chemistry, problems in the preparation of food, such as the physical changes in the cooking of sugars, are of immediate importance. The effect of temperatures of varying degrees in the cooking process is being shown to have an intimate bearing on nutrition. There are rich fields of investigation in the relation of the fundamental structure of plant tissues to cooking processes; the physics and chemistry of textiles;

the physics and mechanics of household equipment; the economics of consumption; the bacteriology of household and institutional sanitation; the art of interior decoration. Physiological studies as to the influence of various kinds of clothing are needed. Economic studies of the problems of home and institutional management are quite as far-reaching as other sorts of economic study. Furthermore, home economics is concerned not alone with the problems of individual homes, but quite as much with the complicated managerial problems involved in the house-keeping of institutions of all sorts.

There are three laws which place responsibility for the development of home economics on the New York State College of Agriculture at Cornell University:

(1) The Administration Act of the College, Chapter 218, Laws of 1906, which specifically charges the College of Agriculture with the three-fold function of offering resident instruction, making researches, and conducting extension work.

(2) The Federal Smith-Lever Act of 1914, appropriating exclusively to the land-grant colleges vast sums for cooperative extension work in agriculture and home economics between these colleges and the United States Department of Agriculture. These funds are provided in annually increasing increments, and require state offset in substantially equal amount. When these funds shall have reached their maximum, in 1923, the annual receipts by Cornell University as the land-grant institution under this law, including the required state offset, will approximate \$330,000. In this bill, agriculture and home economics are recognized coordinately. By act of the Legislature, the provisions of the Smith-Lever Act were accepted by the State, and this institution was designated to carry out the provisions.

(3) The State Farm and Home Bureau (County) Law, which authorizes county boards of supervisors to appropriate money:

For the general improvement of agricultural and home conditions and for the support and maintenance of county farm and home bureaus to conduct demonstration work in agriculture and home economics * * * * *

For the purpose of this act there shall be recognized in each county of the State which shall qualify under this act to cooperate with the State College of Agriculture and the Department of Farms and Markets in conducting the work provided for in this act, a public county association known as a county farm and home bureau association * * * * *

There shall be annually appropriated out of any moneys in the treasury not otherwise appropriated * * * the sum of five hundred dollars (\$500) per annum for home economics for each county in the State which shall qualify as required by this section.

This law further provides:

The general supervision of the cooperative agricultural and home economics extension and development work herein provided for shall be under the joint

direction of the Commissioner of Agriculture and the Dean of the New York State College of Agriculture through a representative to be known as State Leader of County Agents, mutually agreed upon * * *.

On the basis of these laws, thirty counties and three cities—Buffalo, Rochester, and Syracuse—have qualified and are organized with county or city home bureau associations for cooperating with the College and the state and federal departments in home economics extension. The State is pledged to complete the organization of the counties of the State whenever they shall qualify.

In addition, nine county boards of supervisors last year made additional appropriations for junior extension (so-called boys' and girls' club work) in home economics, with every reason to expect that within a few years this work also will receive county funds in every county of the State, as it has commended itself highly. It is now conducted in forty-four counties of the State and twenty-three counties have more or less definite county-wide organizations for its promotion.

The number of persons cooperating locally in the home economics extension follows:

Total membership of women in home departments of county farm and home bureau associations June 1, 1921	22,486
Number of girls and boys regularly enrolled in junior foods and clothing projects	5,500
Number of women enrolled in 113 Cornell study clubs.....	3,203
Number of women on mailing lists, by request, to receive the available extension publications	69,503
Total	100,692

In addition, the College mailed last year 394,420 bulletins on home economics to individual readers.

The maintenance of this extension service necessitates a strong background in teaching and research at the College. Its rapid growth as a voluntary expression of the people has been one of the most difficult and trying circumstances with which we have had to deal. Our greatest single weakness is that as yet we have been able to develop no organization here for research in home economics. A bill now before Congress, if it becomes a law, will make the development of home economics research possible, if in the meanwhile we do not obtain relief from the State at this point. Extension teaching implies something to extend, and it cannot long be sustained unless there is substantial development of knowledge back of it. If the State and the University are to safeguard their re-

sponsibilities for high-grade teaching, they must of necessity adequately develop the fundamental work at the institution.

The question of industrial fellowships

I desire to call attention to a matter of general interest in university circles, namely, the acceptance of funds for the establishment of graduate fellowships in research, from industrial corporations, farmers' organizations, and the like.

The College of Agriculture has now, for many years, accepted grants of money from farmers' organizations and from industries serving agriculture, for the investigation by graduate students, as an important phase of their graduate work, of problems in farming or in the industry in which the donors are particularly interested. In all, more than fifty industrial fellowships, as they are called, have been received by the College. Their acceptance has been on the basis of a careful memorandum of agreement with the donors, approved in each case by the university attorney. While the experience of the College has been wholly satisfactory and no objectionable features have developed, it seemed wise to the Agricultural College Council to request the Dean to appoint a committee from the staff to consider the questions involved from the standpoint of the University, and to report whether it seemed desirable to make any changes in the existing practice, in order to protect the name and the primary interests of the University. The report of this committee, made to the Council on April 29, 1921, is reprinted herewith:

April 21, 1921

The committee which was asked to study the problems of industrial fellowships reports its conclusion that within the field to which they are naturally restricted these fellowships constitute a valuable means of increasing the amount of research work that can be undertaken and that therefore the College should by no means refuse this form of cooperation or restrict its application without well-defined reasons. We indicate what seem to us to be the limitations in the applicability of these grants and mention some attendant dangers which should be kept in mind. We agree that such dangers as may be inherent in the plan have not become apparent in the experience of the College covering a period of several years during which more than fifty of these grants have been administered.

The most obvious danger to which industrial fellowships might be considered subject is that the investigator may be under pressure to go into phases of his problem or to do a type of work which may not be most essential from the educational point of view. As showing how completely the graduate faculty has safeguarded this the resolutions adopted by that faculty on April 22, 1920, are here included:

1. Appointments to industrial fellowships should be made by the faculty of the Graduate School on the recommendation of the group of teachers concerned, in the same way as appointments are made to other fellowships. Whenever possible, these fellowships should be thrown open to competition.

2. If the holder of an industrial fellowship is a candidate for an advanced degree, the terms and the conditions under which the fellowship is given should be submitted for approval to the General Committee of the Graduate School.

3. It is undesirable that the stipend attached to these fellowships should be greater than is sufficient to support a student during the term of his appointment, and it should never be considered as of the nature of a salary for services rendered to the individuals or firms who have endowed the fellowship.

4. In all decisions regarding the acceptance of industrial fellowships, the educational advantage of the students concerned should be the chief consideration. No investigations should be undertaken under the name of graduate work whose interest is primarily commercial and which do not have a direct relation to fundamental scientific principles.

5. No arrangement should be entered into with any individual or firm in regard to the endowment of a fellowship by the terms of which it is stipulated that there shall be delay in the publication of results, or any conditions imposed that are not consistent with the requirements in regard to theses that have been accepted for the degree of doctor of philosophy.

6. Voted, that nothing in the resolutions above stated is to be construed as in opposition to the acceptance by the University of grants by an industry for the investigation of technical problems of that industry; but that such a grant shall not be classed as endowment of a fellowship or fall under the jurisdiction of the Graduate School, unless the investigation is being carried on by a student registered in the Graduate School and may be used by him in partial fulfillment of the requirements for an advanced degree.

A second danger lies in the fact that industrial fellowships may be urged upon the College partly from a desire on the part of the donors to secure an advertising advantage from an investigation conducted by the College. This danger has not been realized in our experience; on the contrary, industrial concerns have shown a willingness to give all reasonable guarantees of good faith in this respect. The memorandum of understanding under which a fellowship is administered can obviate possible difficulty by explicitly indicating how the results of the investigation are to be published.

There is further some apprehension that the acceptance of grants for industrial fellowships may arouse distrust among farmers of the disinterested purposes and freedom from bias of college officials in investigations carried on for industrial concerns. This point of view is reflected in the statement by the dean of a middle-western agricultural college to the effect that he would not think of accepting money from the Chicago packers for an economic study of the beef industry while he would take all they would give for a study of tuberculosis in cattle. This consideration is of such weight as to suggest caution in entering upon arrangements likely to precipitate criticism, but it does not, in the opinion of this committee, justify the College in abandoning the position that it stands ready to help solve problems in the field of agriculture irrespective of the groups by which such problems are presented. There is of course every reason to weigh the relative urgency of the problems whose solution is suggested but progress in the knowledge of agriculture rather than fear of criticism should determine our decisions in these matters.

Finally, it may be suggested that there is danger in creating the impression that the College must promptly give its attention to a problem of interest to any group which offers to furnish the funds needed for the investigation. The agriculture of the State will probably profit most by the investigations of the College if each department or group of investigators will determine upon rather broad fundamental lines of research and in so far as practicable focus most of their study upon these lines until somewhat definite results are obtained. Nothing is better calculated to interrupt work of this sort than to have to respond to the demands of every group that urges its special interest whether or not it constitutes a real emergency.

It may be observed that the field in which industrial fellowships will properly develop has certain natural limitations. Obviously such fellowships will not be available for an attack upon the broader fundamental problems which have no immediate, well-defined, practical bearing. In some fields of agricultural research the more obvious problems have been studied and the unsolved problems are so remotely related to practice that they do not interest the farmer even though their solution is essential to further improvement in practice. Even among those problems which do have an immediate, practical bearing there is a great range in the dependability of the results likely to be obtained. In some investigations it is

reasonable to expect that the findings will be precise, clean-cut, and reliable. In others the nature of the controlling factors may be such that the results will necessarily be undependable under the varying conditions of practice. It would seem to be the part of wisdom to accept grants only for investigations whose results promise to be relatively clear and dependable.

From still another point of view it may be urged that the use of industrial fellowships will be progressively restricted. It seems likely that in the long run more will be accomplished for agriculture if the funds available from private sources are used to employ trained investigators, men who have completed their graduate work. The salaries to be paid would need to be greater but the returns would likewise be greater. This is the method followed in industrial laboratories and it would seem a desirable development in agriculture as well.

Having stated the dangers inherent in industrial fellowships and the limitations of their applicability, the committee is nevertheless of the opinion that the policy now in force should be continued. We regard the safeguards against the dangers as adequate and we recognize that where applicable these scholarships not only greatly increase the amount of research that can be accomplished but they yield to the student the advantage that accrues from work upon problems of vital interest in the situations where they actually arise.

THE EXTENSION ACTIVITIES

The outstanding features of the extension work of the College during the fiscal year ended June 30, 1921, have been the continuation of sound teaching on the various phases of agricultural production, increased attention to the economics of agriculture and to the standardization, handling, and marketing cooperatively of the products of the farm, the inauguration of extension projects in the social phases of country life, the celebration of the tenth anniversary of the inauguration of farm bureaus in the North and West, increased emphasis on the analysis and the systematic programming of farm bureau work, expansion of the home bureau work, and the growth of extension school work.

Field meetings

Outstanding features of the Extension Service during the academic year just closed are in line with the increasing importance of the economics of agriculture and the social phase of country life, as pointed out in the annual report for last year.

The sharp decline in prices of nearly all farm products, more rapid than that of farm machinery, fertilizers, and other equipment materials, has centered attention on savings and economy needed both in marketing and in production. These necessities have found expression in a wave of cooperative enterprise, in which the College has been called upon for counsel and advice, our function being to present fairly both sides of cooperation as a means of effecting savings, particularly through careful grading and packing and standardizing and improved uniform quality, and to supply cost-of-production figures. Work of this sort has been done with the canning-crop growers, the producers of maple sap products,

fruit growers, potato growers, dairymen, poultrymen, and some other groups.

In the purchase of fertilizers, tremendous savings to farmers have been made possible by a wide distribution of facts concerning relative values of materials on the market and information on the possibilities of home mixing of various single ingredients.

A promising field was opened up in two conferences arranged by the College between country merchants, and farmers and their wives. The aim is to bring about a better understanding between buyer and seller, to improve credit conditions and merchandising methods, and to develop better taste in choice of merchandise.

Farm and home institutes held this year were fewer by nearly 35 per cent than in the winter of 1919-20. There was also a smaller total attendance, although the average attendance was 21 per cent higher than last year. The character of the programs did not differ materially from that of last year. The comparative reports from the field indicated a high grade of work done and a growing demand for the all-day type of meeting.

The following tabular statement gives the numbers of meetings of various kinds, exclusive of schools, held from July 1, 1920, to June 30, 1921, together with the attendance:

	Number of meetings	Attendance
Demonstration meetings	996	52,941
Lectures by specialists	1,402	111,026
Conferences and conventions	1,080	18,630
Inspections	4,611	
Farm and home institutes	247	21,791
	<hr/>	<hr/>
Total	8,336	204,388

Number of man-days in the field	4,694
---------------------------------------	-------

On the whole, attendance and interest at meetings during the past year have been entirely satisfactory, the average attendance being somewhat larger than last year. It should be borne in mind that "man-days in the field" is exclusive of time spent in travel to and from headquarters; in other words, it is the net days of constructive work in the field. The total number of personal contacts made, including schools, institutes, demonstrations, inspections, and the like, but exclusive of Farmers' Week and Farmers' Field Days at the College and persons reached at fair exhibits, was 226,528.

Extension schools in agriculture

The total number of extension schools held in the winter of 1920-21 equals the highest previous record, that of the winter of 1915-16, while the total enrollment, 1,919, is exceeded only by that of 1915-16, which was 1,970.

Approximately 80 per cent of the schools held last winter were of three days each, as compared with about 65 per cent of this type of school in the previous year. While the three-days schools have been very popular, a thorough trial indicates that their best use is limited to groups of persons having in high degree a common interest, as, for example, potato growers. The gas-engine schools and the farm-mechanics schools, which have been largely of three days duration, have proved too rigorous for students and instructor alike, and next year the schools will in the main be lengthened to four or five days, exceptions being made, if at all, in communities where similar schools have been held recently.

It is worth noting that the cost to the College of operating schools has been gradually reduced. The average number of instructors at schools last winter was 2.06, the smallest to date. While the fees from one or two 1920-21 schools have not at this writing been received, the estimated cost to the College of each school, exclusive of salaries, is \$25.19, as compared with \$29.43 in 1915-16, the previous low record.

A summarized statement relating to the extension schools follows:

Number of schools held	59	
Number of three-days schools	50	
Number of five-days schools	9	
Counties reached	29	
Total enrollment	1,919	
Average enrollment	32.52	
Largest enrollment	59	(Horseheads)
Smallest enrollment	11	(Port Leyden)
Highest percentage of attendance	96.36	(North Rose)
Average attendance for each session	22.98	
Average number of instructors to each school	2.06	
Length of school season (weeks)	17	

Farmers' Week

The Fourteenth Annual Farmers' Week, held February 14 to 19, inclusive, was the largest in attendance since Farmers' Week was started, in 1908. The total registration this year was 4,116, indicating an attendance probably approximating 4,800. The largest previous registration was 3,763, in 1919. The registration this year represented 58

counties in New York State, and 23 other States and Canada. Fifty-five persons were registered from Pennsylvania, 21 from New Jersey, and 10 each from Massachusetts and Connecticut. Of the counties in New York, Tompkins led with a registration of 1,482, Cayuga was second with 262, Tioga third with 220, and Seneca fourth with 204. In the Tompkins County registration only 405 were from the city of Ithaca, the remainder being registered from the county at large. Undoubtedly the unusual weather conditions, making possible the use of automobiles, swelled the registration from the near-by counties. The program, made up of 293 lectures, 77 demonstrations and round tables, 8 speaking and judging contests, 56 practice periods, 15 conferences, 40 subject exhibits, and 13 banquets and concerts, was similar in arrangement and subject matter to those of previous years, possibly with more emphasis on marketing problems. Demonstrations, round-table discussion periods, and conferences were emphasized.

Farmers' Field Days

Farmers' Field Days, held for the first time last year, were repeated this year on June 23, 24, and 25. Although the attendance was not so large as last year, the interest was excellent. The forenoon of each day was given over largely to tours of the campus and the farms, organized with a definite route and stops, with guides to indicate points of interest. Demonstrations and inspection trips to the fields, the orchards, and the barns were planned for the remainder of the forenoons and for the afternoons.

The attendance was conservatively estimated at 400 on Thursday, 1,000 on Friday, and 600 on Saturday, a total of 2,000.

State Fair

As usual, the contribution of the College to the State Fair at Syracuse was large and varied, and touched nearly every important department of the fair.

The Cornell exhibits were located, as formerly, in several buildings. The main part of our exhibits, in the State Institutions Building, comprised contributions from the Departments of Forestry, Poultry Husbandry, Dairy Industry, Rural Social Organization, Landscape Art, and Farm Management, the School of Home Economics, the Office of Publication, and the State College of Veterinary Medicine.

In other buildings the College staged dairy-manufacturing and milk-testing demonstrations, junior extension exhibits with daily demonstrations by girls and boys, poultry housing, artificial lighting for egg pro-

duction, a floral exhibit, and an exhibit of farm and home products from Indian reservations. One of the best single features of our contribution was the Little Country Theater, which was packed to the doors at nearly every performance.

County fairs

In an effort to aid local fair associations to improve the quality of their exhibits, to rid them of undesirable features, and to add to their educational value, the College has had a committee at work on suggestions along these lines, with particular attention to the revision of premium lists. The recommendations of this committee have already been incorporated, in part at least, in many of the new premium lists.

Thirteen exhibits were sent to 10 county and town fairs in 10 counties, and judges, mainly for cattle, sheep, poultry, swine, potatoes, and apples, were sent to 16 fairs, a total of 22 fairs being reached in 17 counties.

Extension work with Indians

Chapter 662 of the Laws of 1920 authorized the Extension Service of the College to enlarge its field of activities so as to include 6,500 Iroquois Indians residing on the 87,000 acres embraced within the Indian reservations of the State.

Sixteen councils of Indians were held to obtain their official sanction and cooperation, and contacts were made between the chiefs, the farmers, and the housewives of the various tribes of the Six Nations, and the county agents, their assistants, and the officials of the farm and home bureaus of the counties adjacent to the reservations. Indian farmers attended annual and advisory committee meetings, and an attempt was made to incorporate the program for each Indian reservation in the annual program of its respective farm bureau. It was felt that a clear understanding of the purpose and program of each bureau was essential, as well as the recognition that the Indian farmer must himself adjust the program to the needs of his own agricultural community. This recognition of the Indian's right to determine the method of solving his agricultural problem has produced good results, and with returned Indian short-course students participating in the annual meetings of 1922 a better-balanced program will doubtless be projected.

An exhibit contributed by five of the six reservations was staged at the State Fair; three reservations exhibited at their county fairs; and the College, in conjunction with the Erie County farm and home bureaus, put up an instructive and largely patronized exhibition tent at the annual fair of the Iroquois Agricultural Society on the Cattaraugus Reservation.

The premium list of this fair is now being revised by the Erie bureau so that the fair may become more educational in character.

A series of 46 winter and spring meetings, with an average attendance of 38, was held on the several reservations, orchard and poultry demonstrations were staged, and a farm and home institute and a barn meeting were held.

Six Indian boys and three Indian girls selected by the Indians came to Ithaca during the short winter courses in agriculture and home economics, and all six boys are now either officers or in responsible positions in the agricultural societies of the reservations. These nine students were developed with the idea of service to their communities, and, being selected by their own people, they have a deep feeling of obligation to their home folks.

Forty adult farmers and housewives from the six reservations spent Farmers' Week at the College, with wonderful results both to the Indians and to the future program of the College. These Indian people understand the policy and attitude of the College toward them, and a fine spirit of cooperation followed their visit.

To meet the demand for better seed, community plots, operated by the Indian farmers in cooperation with the bureaus and the College, are being carried on with success, and demonstration plots of corn, beans, and potatoes have been established on the reservations. In these plots the Indian maize, considered by the Indian so sacred and valuable, is competing with the white man's varieties for popular favor in Indian country.

Community tractors are in operation on two reservations, a branch of the Dairymen's League has been organized on one, a campaign for the eradication of tuberculosis is in full swing, and an agricultural course in an Indian school is about to be inaugurated. Cooperation in all lines is the watchword.

Two women's units have been organized under the home bureaus, a milk program has been successfully handled by the Indian women, a "food for babies" project has been carried out with good results, and a wide range of better home-making knowledge has been brought to the reservations. A group of Indian women under the leadership of a short-course Indian girl has demonstrated homemade dress forms in a white community off the reservation, and a group of Indian women from another reservation has prepared an Indian cooking demonstration for a white community. This recognition of the fact that the Indian farmer and housewife have something to contribute to the program of the whites is an important factor in developing future cooperative relationships.

The part that Indian farmers and their wives are taking in the development of a program in agriculture and home making, including the junior projects, their attendance at meetings, at Farmers' Week, at fairs, and at farm bureau conferences, their readiness to enact a corn-borer quarantine regulation on one reservation, and their eagerness to try new methods in comparison with their own, are all indications that the time is ripe for the carrying-out of a carefully planned farm and home program in which the Indians' own plans, wishes, and capacities shall be fully considered.

Publications

The principal advancement during the year was the taking-over of the farm study courses, or correspondence courses, which have been enabled to offer a stronger appeal, largely because of the faculty's authorization of a certificate for the completion of advanced courses. With the experience gained during the past year, the correspondence courses promise to develop rapidly during succeeding years. However, they will be held back during the next year because of the curtailment of appropriations for agricultural bulletins.

Provision of home study. Since their reorganization on July 1, 1920, the home study courses have been clearly divided into two classes: the Cornell farm study courses proper, which consist of a consecutive series of bulletin lessons sent one at a time to students, as answers to questions on previous ones are returned; and the advanced study courses, or correspondence courses proper, in which mimeographed lessons and laboratory outlines are based on a textbook which the student purchases. Papers in the advanced study courses are marked by members of the staffs of the subject-matter departments, and a final examination is a part of each course.

During the year, Cornell farm study courses have been started in the eight subjects offered, by 1,856 residents of the State. The subjects are farm crops, the soil, home gardening, fruit growing, dairying, livestock, flower growing, and poultry. An arrangement perfected with Congressman A. B. Houghton has enabled the study courses to procure such farmers' bulletins as were needed, and twenty-four separate farmers' bulletins have been thus used, in addition to thirteen separate bulletins and circulars from the Geneva station and the available Cornell extension and reading-course bulletins. Questions have been prepared and sent out with all the bulletins, in addition to the questions regularly printed in the reading-course bulletins. A total of 5,027 publications have been distributed in the Cornell farm study courses during the year.

The advanced courses. Three advanced courses, in farm crops, vegetable gardening, and fruit growing, respectively, were offered a year ago. Two more have since been added, in poultry husbandry and farm management. During June, 1920, eight lesson papers for advanced courses were received; during the same period of this year, 70 advanced answer papers were sent to the College to be marked, of which 40 were in the original three courses offered a year ago. During the year, 102 persons have registered for the five advanced courses and 492 lessons have been sent out. In answer to a suggestion that winter-course students might keep their connection with the College by means of the advanced courses, 27 students of last year's winter course registered for the study courses. Many study-course students have also written for information about the winter courses.

Statistics compiled in April from the enrollment records of the advanced study courses, showed that 90 per cent of the students are getting actual benefit on the land from their study. Farm owners, owners' sons, hired men, and tenants make up 59 per cent of the students, while 23 per cent are professional men, many of whom own farms, and 18 per cent are skilled laborers. A large majority of the students are between twenty and forty years of age; 60 per cent have had high school training or one or more winter courses at the College; 22 per cent are college graduates; 19 per cent have had no high school education.

Agricultural journalism. Four courses in agricultural journalism are now included in the Department of Extension Teaching. These courses are largely intended for extension workers; however, they have served a useful purpose in fitting for their tasks, writers on agricultural and home economics subjects, and graduates of the courses are already filling important places in this field. To the original course in agricultural journalism, which has been made a three-hours instead of a two-hours course, have been added two-hours courses in the country weekly, in agricultural news writing, and in advanced agricultural information. To these will be added in the coming winter course, or short course, a two-hours course on the rural press.

The news sent to country weeklies has been more widely used than heretofore, and during the past year the news items issued by the College have had an actual known circulation of more than twelve million a month. This has grown since 1915, when the news service was started.

Some investigations. Two surveys have been undertaken in regard to the country-weekly situation in New York State, and these may lead to a further publication on the subject. A further survey to discover what reading matter finds favor with farmers is planned for the coming year.

Publications hampered. Much of the publication work itself, and a great deal of the extension work which depends upon it, has been disadvantageously affected by the fact that many new publications which were ready for printing could not be issued during the preceding fiscal year, a large part of the appropriation having been taken up by the high cost of printing and by the necessity of having reprints made of many of the bulletins which were destroyed in the warehouse fire of July, 1919. Practically all these reprints have been made, and the beginning of the fiscal year finds 27 publications waiting for the new appropriations of 1921-22 to pay for their printing.

Distribution of bulletins. In the distribution of publications, there were sent from the mailing room during the past fiscal year 1,487,468 pieces of matter, and a considerable proportion of this was in response to definite requests. An average of more than a thousand bulletins a day were sent in response to specific queries for information.

The college mailing list now contains 130,244 names, classified except for the home economics bulletins. A comparison with the distribution systems of other similar institutions, including that of the United States Department of Agriculture, indicates that the system now in use at the College is second to none.

Publications issued. During the year the College issued 33 new publications, with 1,719 pages, besides the regular monthly periodicals edited and published in the Office of Publication—the *Extension Service News* for extension workers in all parts of the State, and the *Service Sheet* for country publishers.

The comparatively small number of publications as compared with the fiscal year ending June 30, 1920, when 93 bulletins, with 6,716 pages, were issued, is due to two factors: first, printing costs of 1920-21 were higher than in the preceding year; and secondly, in the preceding year the College had an additional emergency fund for printing, over the regular appropriation. In the coming year, with a 25-per-cent reduction in funds for printing and without reduction in costs, except for paper in large editions, all the work of the College dependent largely on published matter will be hard hit, a situation which vitally affects the service the College is able to render.

These publications constitute a regular part of the annual report of the College and are issued separately as bulletins in various series. Copies of any of them may be obtained on application to the Office of Publication, College of Agriculture, Ithaca, New York, as long as the supply lasts. The list of publications follows:

	Number of pages in printed publication	Number of copies printed
MEMOIRS:		
39 The genetic relations of plant colors in maize (Plant Breeding)	156	4,500
Total	156	4,500
EXPERIMENT STATION BULLETINS:		
403 Raising colts (Animal Husbandry)	49	12,000
Total	49	12,000
READING-COURSE LESSONS FOR THE FARM:		
117 (Reprint) Computing rations for farm animals (Animal Husbandry)	68	3,000
135 (Reprint) The farm ice supply (Rural Engineering) ..	24	5,000
136 (Reprint) The beef breeding herd in New York State (Animal Husbandry)	24	5,000
137 (Reprint) The dairy herd (Animal Husbandry)	24	5,000
139 (Reprint) Swine production in New York (Animal Husbandry)	36	5,000
Total	176	23,000
READING-COURSE LESSONS FOR THE HOME:		
134 Household insects (Entomology)	45	20,000
135 Fireless and steam-pressure cookers (Home Economics)	43	85,000
136 Food preservation (Home Economics)	86	85,000
137 The home laundry (Home Economics)	46	5,000
138 Saving strength in the household (Home Economics) ..	20	5,000
Total	240	200,000
EXTENSION BULLETINS:		
9 (Reprint) Gladiolus studies—I. Botany, history, and evolution of the gladiolus (Floriculture)	100	2,500
11 (Reprint) Gladiolus studies—III. Varieties of the garden gladiolus (Floriculture)	180	5,000
19 (Revised reprint) Control of vegetable diseases (Plant Pathology)	31	5,000
21 (Reprint) How to select laying hens (Poultry Husbandry)	16	10,000
30 (Reprint) Country milk stations: their function, organization, operation, construction, and equipment (Dairy Industry)	32	3,000
*41 Mail study courses in agriculture (Publication)	12	5,000
42 Community songs (Rural Social Organization)	36	30,000
43 Directions for cleaning and care of milking machines (Dairy Industry)	8	20,000
Total	415	80,500

* Dated May, 1920, but omitted from report for 1920.

RURAL SCHOOL LEAFLETS:

September, 1920 (Rural Education)	120	20,000
November, 1920 (Rural Education)	40	150,000
January, 1921 (Rural Education)	58	100,000
March, 1921 (Rural Education)	63	100,000

Total	281	370,000
-------------	-----	---------

JUNIOR EXTENSION BULLETINS:

1 (Reprint) First lessons in sewing (Home Economics)	44	10,000
2 (Reprint) Elementary garment making (Home Economics)	28	10,000

Total	72	20,000
-------------	----	--------

MISCELLANEOUS:

Program for fourteenth annual Farmers' Week, February 14-19, 1921	32	14,000
Farmers' Field Days at Cornell	24	7,000
Information for students	35	750

Total	91	21,750
-------------	----	--------

ANNUAL REPORT FOR 1920	83	5,000
------------------------------	----	-------

ANNOUNCEMENTS:

Announcement for summer term, 1921	28	1,500
Announcement of courses, 1921-22	89	12,500
Announcement of winter courses, 1921-22	39	10,000

Total	156	24,000
-------------	-----	--------

SUMMARY

	Total number*	Total pages	Copies
Memoirs	1	156	4,500
Experiment station bulletins	1	49	12,000
Reading-course lessons for the farm	5	176	23 000
Reading-course lessons for the home	5	240	200,000
Extension bulletins	8	415	80,500
Rural school leaflets	4	281	370,000
Junior extension bulletins	2	72	20,000
Miscellaneous	3	91	21,750
Annual report	1	83	5,000
Announcements	3	156	24,000
	33	1,719	760,750

Farm bureaus

In March, 1921, the farm bureau movement completed the ten-years mark of service in New York State. Broome County was the first county to start the work, and the occasion was celebrated on March 21, at Binghamton. Representatives of the United States Department of Agriculture, the New York State College of Agriculture, the Binghamton Chamber of Commerce, the Lackawanna Railroad, the American Farm Bureau Federation, the New York State Federation of Farm Bureaus,

* Including reprints.

the New York State Federation of Home Bureaus, county agents, and others, were in attendance.

As the farm bureau movement has progressed, farmers have accepted a greater degree of responsibility and each year have been paying a larger percentage of the costs. The membership is now in a transitional stage. In 1920 the farm bureau membership stood at 55,776, and on June 30, 1921, at 47,207. This slight decrease is due to two factors: first, the economic condition in which farmers find themselves has reflected itself on the membership; and secondly, the fees have been materially raised in many of the counties. Five counties have adopted a straight \$5 fee, while a much larger group of counties has the sliding-scale plan, their fees ranging from \$2 to \$10. The State Federation has recommended to the counties that a uniform fee of \$5 be adopted for 1922.

Work of the bureaus clearly educational. Farmers have demanded that assistance be given them in marketing work. The bureaus in New York State have held strictly to the principle that they are created for educational purposes and it is not their function to carry on commercial transactions in any way whatsoever. This does not mean that their efforts must be confined to crop production, as it is as much the function of the county agent to give information relative to marketing as to give information relative to production. County agents have therefore been free to advise with farmers and farmers' organizations regarding cooperative enterprises.

The work of the State Federation of Farm Bureaus has been clearly differentiated from that of the educational institutions, but there has been close cooperation. The State Federation has progressed to a point where a permanent secretary is now employed and is available to look after the interests of the organization that he represents.

Farm and home bureau finances. During the calendar year 1920, the farm and home bureau associations, including 55 farm departments and 26 home departments, obtained, in round numbers, \$536,000 as funds from local sources. In addition to this amount, they received a total of \$45,750 from the New York State Department of Farms and Markets and \$52,203 from the college federal Smith-Lever funds, which makes a grand total of nearly \$634,000 available for the work.

Summary

A statistical summary of the field contacts of all extension specialists, state leaders, and county representatives, is given in the following table:

SUMMARY OF FIELD ACTIVITIES OF EXTENSION WORKERS

Agriculture

Type of activity	Number of persons reached
Extension schools, 59	17,529
Institutes, 247	21,791
Lectures, 1,408	112,361
Demonstration meetings, 996	52,941
Conferences, 1,080	18,630
Farm visits and inspections, 4,611	4,611
Farmers' Field Days, 3	2,000 (est.)
Farmers' Week, 1	4,116
Exhibits at State Fair and at county fairs, 264 days	No record
Special field assistants, 5,343 visits, etc.	13,420
Total	247,399

Home economics

Extension schools, 27	3,336
Institutes, 221	7,705
Lectures, 525	40,198
Demonstration meetings, 363	12,865
Conferences, 169	2,565
Inspections, 10	10
Exhibits at State Fair and at county fairs, 78 days..	No record
Total	66,679

Agricultural agent system

Lectures, committee meetings, and conferences by state county agent leaders, 645	16,454
Meetings, demonstrations, etc., organized or ad- dressed by county agents and assistants, 39,748...	476,641
Total	493,095

Home-demonstration agent system

Lectures, committee meetings, and conferences by state home demonstration agent leaders, 208.....	21,172
--	--------

Meetings, demonstrations, etc., organized or addressed by home demonstration agents and assistants, 8,887	274,409
Total	295,581
Junior extension system	
Lectures, meetings, and conferences by state junior extension leaders, 627	15,383
Meetings, demonstrations, etc., organized or addressed by junior extension leaders and assistants, 11,849	71,349
Total	86,732
Grand total of personal contacts	1,189,486

Agricultural Chemistry

The extension work of the Department of Agricultural Chemistry has consisted of lectures at community meetings and institutes, the analyses of 160 samples of miscellaneous products received at the extension laboratory, and the publication of two bulletins on cider and vinegar prepared by Professor F. E. Rice. Soil samples are now analyzed in the soils laboratory. Other samples received consisted of limestone, feeds, insecticides, fungicides, cases of suspected animal poisoning, vinegar, and other products.

Agricultural Economics and Farm Management

The important developments of extension work in agricultural economics and farm management during the past year were the systematic development of the work under the direction of Dr. C. E. Ladd, and the continuation of lines of work mentioned in previous reports.

The farm management specialists gave 108 lectures to 7,501 persons, taught in 4 extension schools with a total enrollment of 535, took part in 79 conferences and conventions with an attendance of 1,121, made 375 inspections and visits to farms, and took part in 2 demonstration meetings with an attendance of 200.

The farm management surveys in the town of Newfane, Niagara County, were continued for the eighth year, and results were returned to 175 farmers. In Livingston County the results of 724 records taken in 1920 were returned to the farmers.

An advanced reading course in farm management was prepared and published. Before the end of the year ten persons had enrolled for this course.

Other extension activities include the preparation of a new farm-account book approved by the American Farm Bureau Federation and by the United States Bureau of Internal Revenue for income tax purposes, of which 2,800 copies have been sold to farmers at cost; the supervision of cost-account keeping on 36 farms where the work was completed this year, and the starting of 44 accounts for the coming year; the taking of 355 survey records on the cost of producing canning-factory crops, and the closing of 100 single crop account books for growers of canning-factory crops; and the return of 163 records of the cost of producing milk on farms in Herkimer County.

Animal Husbandry

The extension work of the Department of Animal Husbandry has been continued along lines similar to those of previous years. In the absence of Professor H. A. Hopper on sabbatic leave, Professor C. H. Royce carried the general responsibility for the extension work of the department.

As heretofore, there was extension work for the improvement of the dairy herd, the better utilization of farm-grown feeds, the purchase and mixing of concentrated feeds, and the supervision of the advanced registry records of dairy cows. This last phase of extension work requires the services of from thirty to one hundred supervisors, depending on the season. During the past three years, 3,375 official seven-days records have been supervised for more than 400 breeders, and 1,025 cows have been carried on monthly inspection for 160 breeders.

The dairy-improvement work of the past year has been continued. There was a decrease in this work early in the year due to the financial depression, but a recovery later in the year with the organization of four more associations in May and June. There are now 25 dairy-improvement associations covering 465 herds and 8,720 cows.

Botany

The extension work in botany during the past year has included the sending of about 2,000 inoculation cultures, involving the writing of 250 letters, and other correspondence including about 200 letters on weed and plant identification and about 30 in reply to miscellaneous inquiries.

Dairy Industry

The past year has developed a heavier demand than ever before for extension work by the Department of Dairy Industry. The work of Professor J. D. Brew in making bacteriological analyses of milk samples at shipping plants, and diagnosing troubles in connection with this work, has developed a very large demand for service of this character in all of the dairy sections of the State. Both Professor Brew and Mr. Ayres have engaged in this work and it has well-nigh excluded all other work since early in the spring. Mr. Ayres has also continued his work in connection with the butter plants throughout the State.

Professor Fisk has met a number of urgent requests for help in connection with the manufacture of cheese and ice cream.

Entomology

Cooperation between the Department of Entomology and the Department of Plant Pathology in most of the work relating to insect pests and plant diseases, has been continued with increasingly satisfactory results. In this connection special emphasis has been placed on demonstration work conducted by special field assistants, which was described in the report for 1919-20 and is again referred to in the report of the Department of Plant Pathology on pages 68 and 69.

There was also cooperation with the United States Bureau of Entomology, looking forward to an experimental demonstration of the feasibility of exterminating the warble fly in one of the dairy counties, yet to be designated, and in conducting an insect-pest survey; in both cases with financial assistance from the Bureau.

In 1920 there was a serious outbreak of the Hessian fly, but the damage from this source was minimized because information obtained in an annual examination of wheat fields by the Department of Entomology enabled the department to warn wheat growers to do their sowing after the fly-free date.

In much of the entomological extension work, and particularly in that relating to special field assistants, the College has had hearty and sympathetic cooperation from Professor P. J. Parrott, of the New York Agricultural Experiment Station at Geneva, and Dr. E. P. Felt, State Entomologist.

The services of the specialist in bee keeping were in greater demand than ever before. He spent 162 days in the field working in 33 counties, conducted 53 demonstrations with an attendance of 835, gave 65 lectures with an attendance of 2,651, attended 36 conventions with an attendance of 1,618, and made 66 farm visits. In the course of the year he made

5,170 contacts, and wrote 1 magazine article, 5 circular letters with a circulation of 1,000, and 870 personal letters.

The work of the bee-keeping specialist was done largely through 36 active bee-keepers' associations, several of which did good work for their members in the cooperative purchase of bee supplies. One association, with 30 members, purchased \$2,300 worth of supplies at a saving of \$900; another, with 15 members, saved \$95 on their purchases.

The work of Dr. A. A. Allen and C. R. Leister in the relations of birds and mammals to agriculture has been continued as in former years. It has consisted largely of lectures, exhibits, and correspondence concerning the beneficial and harmful birds and rodents.

Farm Crops

The extension work of the Department of Farm Crops has included that of two divisions—farm crops and vegetable gardening.

Farm crops. Demonstrations of improved methods of growing crops and the use of good varieties and strains of farm seeds were conducted in all but three of the agricultural counties of the State.

The importance of good seed has been demonstrated with potatoes and oats. In a demonstration on seed potatoes of the Green Mountain variety in Suffolk County, the ten highest-yielding strains produced 409 bushels of potatoes to the acre, while the ten lowest-yielding strains yielded 285 bushels to the acre. In Erie County a disease-free stock produced 168 bushels to the acre and showed 1 per cent of disease, while a common stock yielded 99 bushels to the acre and showed 45 per cent of disease. Oat variety demonstrations showed that recommended varieties of Silvermine and Swedish Select types outyielded all other varieties by 25 per cent. In a similar way it has been shown that good varieties of medium dent corn produce 25 per cent more than the common flint varieties.

Demonstrations were also conducted which showed that native northern-grown clover seed is superior to imported seed, and that northern-grown variegated alfalfa has a great advantage over other strains from sources farther south.

Assistance was given to the Grange League Federation Exchange in locating commercial sources of good alfalfa, grain, and grass seeds for the farmers of the State.

There was continued cooperation with the New York State Potato Association in inspecting fields of potatoes grown for certification by the association. This inspection of 1,270 acres resulted in the passing of 766 acres with a total yield of 190,000 bushels.

Extension workers in the farm crops division spent 358 days in the

field, took part in 65 demonstration meetings with an attendance of 1,120, gave 80 demonstrations with an attendance of 2,735, took part in 95 conferences and conventions with an attendance of 2,710, made 772 farm visits, spent 29 days teaching in extension schools and 16 days at exhibits, and wrote 20 articles, 16 circular letters, and 2,791 other letters.

Vegetable gardening. Two distinct lines of extension work in vegetable gardening were carried on during the year, one dealing with commercial gardening and the other with home gardening, garden clubs, potato clubs, and corn clubs.

In commercial gardening, special emphasis was given to strain and variety demonstrations with cabbage, tomatoes, cauliflower, celery, and onions; plant-growing and -grading demonstrations with tomatoes and cabbage; and fertilizer and cover-crop demonstrations.

Strains of Danish Ballhead cabbage varied in yield from 9 to 18 tons to the acre, the heaviest yielder and the best strain being from New-York-grown seed. Cauliflower strains showed a variation in percentage of marketable heads from 21 to 60 per cent.

The value of grading plants and discarding the poorer ones was demonstrated in four demonstrations in three counties. Tomato plants of the best grade increased the returns \$95 an acre over second-grade plants. Late cabbage plants of grade 1 produced 3.3 tons greater yield than those of grade 2, and 9.3 tons greater yield than those of grade 3.

At the end of June, 87 demonstrations had been started in 19 counties. These demonstrations cover all important phases of vegetable production.

One man has devoted his entire time to home and school gardening and to crops-club work with boys and girls in cooperation with the Department of Rural Education. Extension work in home gardening has consisted of furnishing information through lectures and personal letters, and in cooperation with the Office of Publication in the formulation of a correspondence course and in furnishing a series of timely articles on gardening for the use of the daily and weekly papers of the State. About 75 of these articles have been sent out during the year, and the total printed circulation has been between two and one-half and three millions.

There are enrolled in the junior crop and garden projects this year 4,596 girls and boys. Last year's enrollment was 4,443. There has been a slight decrease in the garden, corn, and bean enrollments, and an increase of potato workers from 1,218 to 1,661. These project workers have been given instruction in the work of their projects by means of mimeographed letters and suggestions, and as far as possible by lectures and demonstrations. Instruction has been given to groups of teachers and other local

leaders, and outlines for demonstrations and other exercises have been prepared for their use.

The extension workers in vegetable gardening spent 344 days in the field, conducted 17 demonstrations with an attendance of 587, gave 147 lectures with an attendance of 11,293, attended 238 conferences and conventions with an attendance of 1,127, made 527 inspections or farm visits, and wrote 105 articles covering a total of 153 pages of manuscript and having a circulation of 3,000,000, 17 circular letters with a circulation of 1,494, and 1,570 other letters.

Forestry

The extension work in forestry has been continued under the policy of concentrated effort on a few things that seemed most in need of attention. Most of this work has been done by Professor G. H. Collingwood, who has had some assistance from Mr. Guise and other members of the staff. The field activities of this work are indicated by the following summary:

Days in the field	108
Demonstrations	16
Attendance	68
Lectures	15
Attendance	899
Conferences and conventions	64
Attendance	503
Inspections	51
Days at exhibits	6

Assistance to the maple sugar industry has been continued in a broad and systematic way, particularly through the encouragement of cooperative efforts among the producers. While the time is approaching when this type of assistance will no longer be needed, it is thought that at the present time it is important and requires considerable attention. A manuscript for a bulletin on the maple sugar and maple sirup industry has been prepared.

During the winter and early spring of 1921, considerable attention was given to aiding and encouraging land owners in tree-planting work, with the result that the department has been concerned in the planting this spring of 237,000 seedlings and transplants of forest-tree nursery stock.

Another important line of work has been that of assisting woodland owners in the proper management of their forest tracts, especially farm woodlots.

The relations between the Department of Forestry and the farm bureaus in the State are being constantly strengthened, and many new contacts have been made through the regional conferences with county agricultural agents.

Those living in the wooded parts of the State are rapidly coming to a realization of the fact that the forest resources of the State are being rapidly depleted and that it pays to give intelligent attention to the care of woodlands. It is highly important that this state of mind be capitalized and made effective through action leading to better forest management as well as forest planting. In the accomplishment of this aim, a well-supported and vigorously promoted forestry extension policy by this institution will render invaluable aid.

Home Economics

The main projects in extension work in home economics during the past year have been directed toward (1) improving and maintaining the health of children and adults through establishing good food habits, personal hygiene, and sanitary home conditions; (2) assisting home makers in selecting and making clothing; and (3) laying the foundation for future work in child training.

The college specialists have helped the county and city home bureaus plan their programs of work, and have also given lectures and demonstrations, conducted five-days extension schools, helped in organizing nutrition-health classes for children, and trained local leaders for passing on instruction.

Probably the most constructive part of the year's work in nutrition was done in connection with the seven nutrition-health classes which the specialist assisted in organizing and in which 244 children were enrolled.

The serving of hot school lunches has been encouraged, and in almost every county the number of schools serving them has increased. The nutrition specialist worked in 22 counties and reached 3,178 persons, through 44 lectures with a total attendance of 2,089 and 9 extension schools with a total attendance of 1,089.

The foods project has emphasized a liberal use of milk and the preservation of food. Two cars for exhibits and demonstrations were run over the New York Central lines during May and June in cooperation with the New York Central Railroad and the Child Health Organization of America. Demonstrations on the use of milk were given every afternoon, and school children were taught the rules of health in the mornings. The food specialist gave thirty lectures and demonstrations on these cars, with a total attendance of 2,777. During the year the food specialist

visited 33 counties and gave 50 lectures and demonstrations with a total attendance of 47,086, in addition to conferences on the program of work with home bureaus.

The specialist in diet in the treatment and prevention of disease gave 31 lectures reaching a total of 1,475 persons.

The project to promote health in the home has been under way only half the year. The specialist has given lectures to show the relation of home sanitation to the health conditions of the community, and has worked with members of the home bureau and of women's clubs in formulating minimum standards for sanitation of rural homes, and outlines for scoring homes, to be used by persons who have volunteered to study their own home conditions. During the past half year the specialist has worked in 11 counties and has given 52 lectures with a total attendance of 1,312.

The clothing project has emphasized the economic, hygienic, and aesthetic principles of selection and construction of clothing. The project has been developed through the work of one specialist in conducting 18 five-days extension schools in 12 counties with a total attendance of 2,159 and in giving 15 single lectures and demonstrations in 10 counties with an attendance of 579, and that of two other specialists organizing and developing local-leader training schools, a new method of extension teaching.

In the latter type of work two representatives elected from each interested community met in district training schools, received instruction from the specialist, and then not only gave this subject matter to home makers in their respective communities but also encouraged the establishment of textile-testing departments in the larger stores and better quality and assortment of goods in the small rural and village stores, and the establishment of home economics in local schools. Training schools were held each month for from four to six months in each of the 11 counties cooperating, the number of schools in each county varying from two to five depending on the number of communities cooperating. The attendance at each school varied from 10 to 28. The figures are as follows:

Territory covered	11 counties, 1 city
Training schools held	93
Communities represented	255
Leaders trained	726

In addition to these figures for training schools, the specialist in charge also held 29 meetings for organization purposes with 1,697 in attendance.

A beginning was made this year in extension instruction in attractive home surroundings. Material for a loan exhibit was prepared, ten lectures were given by the specialist with a total attendance of 432, and

assistance was given in several cases in making rest rooms, community houses, and home bureau offices function as demonstration centers of good environmental conditions.

Twenty lectures on child training were given by a resident instructor who visited 8 counties and addressed 3,299 persons. The enthusiastic response given by home makers to this piece of work has indicated a strong desire for its continuance as a well-established extension project.

In all, extension work in home economics has been done in 50 counties during the year, by nine specialists (four on part time) who have given 363 lectures and 525 demonstrations with a total attendance of 58,857, conducted 27 extension schools with a total attendance of 3,336, and held 165 conferences with a total attendance of 2,565.

Home demonstration work. The home bureau organization has grown 22 per cent during the past year. The increase includes the addition of five newly organized counties—Tompkins, Chemung, Herkimer, Lewis, and Madison—and of one new city home bureau in Rochester. This brings the total to thirty counties and three cities, as follows: Allegany, Broome, Cayuga, Chemung, Chenango, Cortland, Delaware, Erie, Herkimer, Jefferson, Lewis, Madison, Monroe, Nassau, Niagara, Oneida, Onondaga, Orleans, Oswego, Otsego, Rensselaer, Saratoga, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Wayne, and Westchester Counties; and Buffalo, Rochester, and Syracuse. On June 1, 1921, these home bureaus had a membership of 22,486 home makers, which is an increase over the membership of last year of 6,000 members.

The organization of home bureaus is under way in two additional counties, and preliminary requests have been received for extending the organization to several other counties.

Although the past fiscal year has been one of financial retrenchment, the home bureaus have received more generous local public support than ever before through appropriations by the county boards of supervisors. Every home bureau in the State has received a county appropriation, the average amount being \$2,857.39. These appropriations total \$94,294, which, added to the returns of \$22,486 from membership dues, gives a grand total of \$116,780 from county support.

The home bureaus have grown stronger in power for service. The farm women have shown capacity for leadership under the stimulus of an organized means of acting together to better the things that concern home and community life. More than a thousand women are serving on the executive and other committees of the state, county, and commu-

nity home bureau organizations, and are functioning to give increasingly better local direction to the extension service in home economics and to do for rural community life the vital things that need to be done to preserve and supplement the fundamental institutions of rural life. Thus the home bureaus have helped to organize wholesome recreation, have helped to reopen closed rural churches, have established playgrounds for children, and rest rooms and women's exchanges for farm women, in towns where they trade, and have taken an active and intelligent part in the movement for better rural schools in New York. The organization of the State Federation of Home Bureaus, with its statewide and district meetings, has promoted acquaintance and mutual helpfulness between the home makers of the various communities.

The home bureau programs throughout the State have shown development during the past year in their more specific aims and methods to improve home and community conditions. The executive committees and agents have cooperated with the College in projects to promote the following as main lines of work: optimum nutrition of children and adults, healthful home and community conditions, selection of good clothing and labor-saving methods of making clothing, the use of labor-saving equipment in homes, a more widespread understanding of civics as it relates to home making, more wholesome recreation in homes and communities, the improvement of rural schools, and the improvement of fairs. An effort has been made to strengthen the home bureau program by the appointment of one person to have the responsibility of correlating the college program with the county program.

Landscape Art

The extension work in landscape art has been continued under the same plans as in the previous year, with the point of view of assisting farmers and rural schools and villages in enhancing the value and attractiveness of their property by better arrangement of details and by the planting of suitable trees, shrubs, and vines in proper relationships. This work was in charge of Professor R. W. Curtis, who spent a small part of his time in the field and was assisted by J. P. Porter, whose work was primarily of an extension character. These two men spent 52 days in the field, conducted 2 demonstrations attended by 47 persons, gave 14 lectures attended by 1,696, attended 14 conferences with 109 persons, made 34 inspections, and spent 12 days with exhibits.

Each demonstration is likely to require considerable special study, a survey, the preparation of sketch plans, and some supervision of the work undertaken by the local individual or group. But once the results

of the work are apparent, it becomes a living demonstration for all who pass that way.

Meteorology

The Department of Meteorology has continued to cooperate with the United States Department of Agriculture and the county agricultural agents in furnishing local weather forecasts to interested farmers during the haying and harvesting season. This year arrangements were made for a considerable number of county agricultural agents to get special forecasts each day and to make these available for farmers who might call the office of the county agent by telephone.

The department continued to supply a speaker occasionally for meetings in various parts of the State.

Plant Breeding

While the Department of Plant Breeding had no formal extension project, the members of its staff spent 88 days in the field in activities that may be classified as extension work. They conducted 22 demonstrations with an attendance of 560, gave 4 lectures to 405 persons, attended 2 conferences with 28 persons, and made 92 inspections.

One hundred and thirty bushels of seed oats were distributed among 19 cooperators, 72 bushels of barley among 22 cooperators, and 8 bushels of wheat among 5 cooperators. A large amount of seed wheat, oats, and barley was sold by cooperators through contacts made by the department.

An agreement was entered into between the College and a prominent seed firm of the State, for the latter to grow and offer to the trade strains of wheat, oats, corn, barley, and timothy under inspection by representatives of the Department of Plant Breeding. Such an agreement is open to any firm that will comply with the conditions specified.

Plant Pathology

The extension work of the Department of Plant Pathology has been increasing steadily year by year, and the demands for this work are increasing more rapidly than are the facilities for doing it. This change is due to the development of the farm bureau organization in the State, and to the better appreciation among farmers of the losses occasioned by plant diseases and of the value of employing control measures.

The Department of Plant Pathology has continued to cooperate with the Department of Entomology in the supervision of the work of eight field assistants conducting plant-disease and insect control work for six months during the growing season in eight counties, working through the

office of the county agricultural agent in each of these counties. Four of these men were placed directly by the College and four are assistant county agents appointed as special field assistants by the College to conduct this work. Each received \$50 a month from the College as salary, the balance of their salary and all expenses connected with the work, including the use and maintenance of a car, being provided by the farm bureau. The projects conducted by these men include a fruit-spray information service, potato spraying and seed-plot work, onion-smut control, and control of vegetable diseases and insect pests, also responding to numerous inquiries by personal visits, telephone, and correspondence. They report to their leaders on the appearance, distribution, and control of diseases and insect pests, and these reports are circularized weekly to all cooperating agents.

Continued emphasis has been put on potato improvement as a subproject. This was emphasized in winter meetings and schools, and during the summer 75 field meetings were held with an attendance of 1,794 persons. More than 1,000 persons carried out the subproject. Requests for work on this subproject for the coming season have come from 34 counties and will require the time of two specialists during two summer months. The department also has charge of the potato inspection work, inspecting more than 1,200 acres of 281 growers in 26 counties. Three inspectors were employed during the summer, their salary and expenses being paid from fees charged for their work. These were based on actual cost and amounted to 67 cents for each inspection acre, or 1.13 cents a bushel of those passing all inspections. This work of the department, in cooperation with the Department of Farm Crops and the county farm bureaus, has resulted in a great increase in the planting of better seed.

An important piece of extension work has been conducted by R. S. Kirby in cooperation with the Suffolk Cooperative Association on the control of root, stalk, and ear rot of Luce's Favorite Seed Corn grown by the association. The control consisted of selection and seed testing. Mr. Kirby tested more than 12,000 ears of corn for the 1921 planting, besides maintaining seed plots on Long Island and up-State, making a survey of the disease, carrying on an investigation of the disease, and instructing the grower in its nature, cause, and control.

In cooperation with the United States Department of Agriculture, a limited plant-disease survey was maintained during the year. Three men were sent by the Federal Department to this State and under our direction made inspection for potato wart in 935 gardens not covered in the survey last year. No potato wart was found in the State. The other survey work

consisted in recording and reporting to the Federal Department such diseases as came to our attention. This work was done under the direction of Dr. M. F. Barrus, who, with Dr. C. Chupp, H. E. Thomas, R. S. Kirby, and members of the resident teaching staff, spent 244 days in the field, conducted 73 demonstrations with an attendance of 1,972, gave 41 lectures to 1,666 persons, attended 90 conferences with 1,256 persons, made 552 inspections, taught in extension schools with a total enrollment of 913, and lectured in farm and home institutes with an attendance of 130.

Pomology

Extension work relating to pruning and to the marketing of fruit has been in great demand throughout the year. Many calls for demonstration work in pruning could not be met owing to the resignation of C. G. Vinson on September 1, after which Professor Rees was alone in the work until Professor Peck was appointed on January 1. An interest in long-time demonstrations of pruning and soil management has become apparent, and such special problems as top-working, bridge-grafting, and pollination have received considerable attention.

Extension work on problems relating to marketing has been carried on primarily in connection with the organization of fruit-packing associations. At the beginning of the packing season the extension specialist cooperated with the Western New York Fruit Growers' Cooperative Packing Association, Inc., in conducting a school for packing-house superintendents. The work consisted of lectures on equipment, operation, management, and standardization, and visits to six packing houses. A representative of the department made a careful study of operation methods and equipment in representative associations during the packing season. Much information was obtained which is being passed on for the improvement of older associations and the benefit of new ones which have not yet operated.

The organization of the Western New York Fruit Growers' Cooperative Packing Association, Inc., was one of the most important forward steps in cooperative packing. Professor Rees assisted materially in an advisory capacity in working out the details for organizing and operating this association. The principal benefits claimed by growers from membership in local cooperative packing associations and the central association are: (1) relief from the bother of packing; (2) reduction in cost of high-quality pack; (3) savings on packages and cold storage; (4) the opening of new markets for New York apples—mainly through chain stores; (5) receipt of a price above the average received by non-members.

The field activities of the extension specialists in pomology may be summarized as follows:

Days in the field	211
Demonstrations	56
Attendance	1,130
Lectures	42
Attendance	2,897
Conferences and conventions	71
Attendance	2,117
Inspections	150
Schools—attendance	582
Days at exhibits	9
Lectures at farm and home institutes—attendance..	3,634

Poultry Husbandry

The extension work in poultry husbandry has been continued without much change in plan. A large amount of culling has improved the flocks for egg production, and there is increased interest in, and demand for, the certification of birds for breeding purposes.

Five members of the Department of Poultry Husbandry have devoted themselves primarily to extension work, and others have taken considerable part in it. Members of the department spent 764 days in the field, conducted 356 demonstrations before 6,633 persons, gave 186 lectures attended by 8,820 persons, attended 14 conferences at which 154 were present, made 730 inspections, taught in extension schools that had a total attendance of 839, spent 110 days with exhibits, and lectured at farmers' institutes before 579 persons.

The long-time breed-improvement program includes six steps: the culling of undesirable birds; the certification of the choicest individuals; the trapnesting of a few of the best certified birds; the mating of the best trapnested birds with high-line Cornell males; the distribution of Cornell pedigreed males; and the distribution of Cornell pedigreed chicks.

During the past year the extension workers of the department selected 2,603 fowls and obtained promises from farmers for the selection of 288,230 fowls. It is estimated that about 90 per cent of the persons promising this selection actually cull their birds.

In the certification work, Cornell bands were placed on 12,763 fowls on 177 farms. In the advanced registry work, 354 birds were entered from 43 farms in 28 counties. The annual distribution of Cornell pedigreed stock included 150 cockerels and 3,500 baby chicks bearing wing-

bands and accompanied by records of their ancestors for several generations.

Advisory relations with the Department of Farms and Markets in the management of eight institution farms have been continued since June, 1918, and now show important comparative results. Starting with 3,306 hens and with an average production of 86.1 eggs to the hen at these farms, the number of hens has been increased to 5,824 and the average number of eggs to 109.6, which is a 27-per-cent increase. This work with institution farms involved an average of four visits to each farm each year.

The poultry-farm-management project in which one specialist has served the poultrymen in five southeastern counties has been continued. This work has been so useful and popular that other sections are demanding like service. Plans are practically completed for changing the basis of sharing expense so that in future the cooperators will pay all of the maintenance and half of the salary of the poultry specialist. Heretofore, during the demonstration stages of the project, the cooperators have not paid any part of the specialist's salary.

Rural Education

In connection with the study of rural schools in New York State under the direction of Professor G. A. Works as chairman of the Committee of Twenty-one, the staff of the Department of Rural Education has been called upon to do a large amount of extension work to familiarize rural school patrons with the purposes and progress of the study.

Immediately following Farmers' Week the department, with the assistance of Dr. M. B. Hillegas, conducted a one-week school on rural school supervision, which was attended by 25 district school superintendents.

Junior extension. During the calendar year 1920, junior extension work was continued under the same plan and financial arrangement as in 1919. The usual financial arrangement includes \$600 from the College of Agriculture, a refund of \$600 from the State Education Department, and local funds derived from appropriations and private contributions. County junior extension boards are now regularly organized in 23 counties, of which 12 employ full-time county leaders and 5 employ half-time leaders in cooperation with state schools of agriculture. During the year junior extension work was carried on in 44 counties, that in counties not employing regular county junior extension leaders being conducted by local voluntary leaders. There were 640 of these leaders in the State last year, 569 of whom completed the work. For the most part these local leaders are rural school teachers or vocational teachers of agri-

culture, though a considerable number are recruited from successful farmers and home keepers.

The organization of the Junior Extension Office at the College includes the state leader, two assistant state leaders, two subject-matter specialists in home economics, and one specialist in crop projects. Extension specialists in poultry and animal husbandry give some time to junior extension work.

An official of the State Education Department known as the State Supervisor of Junior Home Project Work represents that institution in the cooperative relationships.

The scope of the junior extension work was changed during the year. It has consisted of projects in gardening; potato, corn, and bean growing; poultry, rabbit, calf, pig, and sheep raising; cow testing and record keeping; foods; and clothing. In some cases handicraft work in making such articles as feed racks, crates, flats, plant boxes, and seed-corn racks, has been introduced in connection with appropriate projects and has provided useful employment in winter months. The total enrollment for the year was 15,064.

For the most part, county junior extension leaders have confined their activities to work with girls and boys, but it is now clearly apparent that many farmers are adopting improved practices as a result of the work done by their own or their neighbors' children. This has been particularly apparent in the introduction of purebred stock, better feeding, potato-seed treatment, potato spraying, and poultry culling.

Rural Engineering

In the extension work in rural engineering during the past year, special emphasis was placed on a joint farm and home bureau project on running water and sewage disposal. This project was carried out by means of a truck equipped with a skeleton portion of a house, and a complete water system and sewage-disposal system, which were erected and demonstrated at each stop. Fifty stops were made in 33 counties of the State and 4,500 people attended the demonstrations. This work was followed up during the winter with community meetings and farm shop schools.

As in the previous year, the department placed particular emphasis on the development of extension schools. Gas-engine schools entirely replaced the tractor schools. It was thought that the principles underlying the operation of the small gas engines were the same as those of the large, complicated, multi-cylinder tractor engines, and the small engines were more easily accessible. The farmers brought in their own engines and worked on them with special zest because of personal interest in them.

An entirely new type of extension school was held last year by the department. This was the farm shop school, in which was taught such work as harness repair, soldering, care and use of edged tools, and saw filing. Only two of these schools were held, but the demand for them next winter is large. As there was no available text on harness repairs, Professor Behrends has prepared manuscript for a bulletin on this subject to be published in the reading-course series.

Members of the department have taken part in or conducted the following extension schools:

Three-days gas-engine schools	24
Average attendance	33
Three-days farm-mechanics schools	4
Average attendance	32
Milking-machine schools in cooperation with the Department of Dairy Industry	3
Average attendance	24
Farm shop schools	2
Average attendance	28
Gas-engine school in cooperation with the Depart- ment of Plant Pathology	1
Attendance	21
Gas-engine school in cooperation with the Depart- ment of Farm Management	1
Attendance	48
Community meetings	27
Attendance	938

Rural Social Organization

On the first of October, C. W. Whitney commenced work as extension instructor in rural social organization, and throughout the year he devoted his attention mainly to rural recreation including community singing and rural dramatics. There has been a lively interest in Mr. Whitney's work and a great demand from the farm and home bureau agents for his services. Mr. Whitney has also held several training schools of one or two days for rural leaders in recreation.

Packages of plays are loaned for examination so that persons may order those desired from the publishers, and this service has proved very popular, there usually being a waiting list for these packages. One or two counties are planning to develop a "Little Country Theater" at their county fairs, using several troupes from different localities in the county.

A considerable demand for advice on community houses and community

organization has taken Professor Sanderson, head of the department, into the field many times in the course of the year.

Two members of the department spent 93 days in the field. They conducted 4 demonstrations with an attendance of 290, gave 95 lectures with an attendance of 18,639, and attended 14 conferences and conventions with an attendance of 174.

Soil Technology

The extension work in soil technology has been conducted by Professors E. L. Worthen and A. F. Gustafson. The field demonstration work has been continued along the same lines as in the preceding year. About 200 lime demonstrations were conducted in the summer of 1920, and many of these have been continued. Approximately 50 new lime demonstrations were established this season. The fertilizer demonstrations consist largely of acid phosphate and lime as compared with lime alone, but in some instances acid phosphate is being compared with a complete fertilizer. A few soil-improvement or soil-utilization projects have been started.

In the main the county agricultural agents have been responsible for conducting the field demonstrations, but the specialists have given considerable time to supervision of the work.

The field work of the soils specialists has taken them from the office 212 days; they have given 77 lectures with an attendance of 2,166, attended 71 conferences and conventions with an attendance of 1,356, made 60 inspections, taught in extension schools with an attendance of 277, and lectured at farmers' institutes with an attendance of 1,965.

The office work has demanded considerable time and attention. In addition to a large correspondence with farmers, special attention has been given to requests for expert advice from county agents and various organizations. The county agents were given frequent advice as to the fertilizer situation, and articles for their county papers have been furnished monthly. Several articles have also been written for the agricultural press, and a leaflet has been published on *Home Mixing and Use of Fertilizers*. Some idea of the volume of office work may be had from the fact that 367 soil samples were examined, 13 circular letters were prepared and mailed to 736 addresses, and 2,628 letters were written.

THE RESEARCH ACTIVITIES

The following is a brief report of the research activities of the various departments during the year. It should be explained that the productive research of the College is greater than the report of published work indicates. The printing funds of the College for the year were so in-

adequate that only two experiment station manuscripts were printed, although at least fifteen more would have been printed if funds had been available.

In reviewing the research activities, special attention should be drawn to the work which J. H. Comstock, Emeritus Professor of Entomology, has been doing since his retirement from active teaching. He works daily among us, setting for all a fine example of untiring devotion to the pursuit of truth. He is putting the ripe results of his life work into a series of books, where they will be permanently available to students. Two of them, *The Wings of Insects* and *Introduction to Entomology*, both already in use by entomologists all over the world, have been published since his retirement, and another larger work is nearing completion. These, added to his many contributions of the earlier years and the memory and devotion of countless numbers of students now at work in every land, will be his enduring monument. An institution having such a man associated with it has an incomparable advantage.

Agricultural Chemistry

In the Department of Agricultural Chemistry the following paper has been published:

F. E. Rice—A new conductivity cell. *Journ. indus. and eng. chem.* **12:1202.** 1920.

The conductivity cell here described is of an entirely different design from those commonly in use. It has the advantage of being easily constructed and is of a type that lends itself readily to cleaning. It is not easily broken and cannot be put out of adjustment. It is designed for work where convenience and ease of handling are of greater importance than the utmost accuracy in determining the electrical conductivity of liquids.

The following papers are ready for publication:

F. E. Rice—The electrical conductivity of milk.

A study of the lipolytic enzymes in milk and a method for their determination and estimation.

A quantitative method for the determination of peroxidase in milk.

The following work is under way:

L. J. Cross—Nature and properties of the pectins.

F. E. Rice—A physical chemical study of milk with high apparent (abnormal) acidity.

The application to food problems of apparatus which has heretofore been used for the most part in theoretical chemical investigations, such as apparatus for hydrogen ion determinations, osmotic pressure, and so forth.

Agricultural Economics and Farm Management

In the Department of Agricultural Economics and Farm Management the following papers are ready for publication:

E. G. Misner—An economic study of dairying on 149 farms in Broome County, New York.

An economic study of dairying on 163 farms in Herkimer County, New York.

- W. I. Myers—An economic study of farm tractors in New York.
- C. V. Noble—The cost of living in small factory towns.
- H. D. Phillips—Horse raising in colonial New England.
- G. P. Scoville—Potato production and prices.
- G. F. Warren—Cost accounts for six years on New York farms.

The following work is under way:

- Van B. Hart, W. I. Myers, R. L. Gillett, C. V. Noble, and others—Cost accounts on some New York farms.
- P. V. Horn—Some factors influencing the demand for retail cuts.
- R. G. Knapp—Factors involved in the success or failure of cooperative farmers' stores.
- E. G. Misner—Economic studies of dairy farming.
- W. I. Myers—To determine the methods and costs of farm credit as obtained by farmers through various agencies—country stores, implement dealers, fertilizer dealers, banks, and so forth.
- L. J. Norton—The cost of producing crops grown for canning factories in western New York.
- F. A. Pearson—On milk and fat production and other associated characters.
- G. P. Scoville—Farm management surveys.
Price and production data (potatoes, apples, hay).
- G. F. Warren—Economics and milk production in New York State.
Prices of farm products.
- G. F. Warren, K. C. Livermore, G. P. Scoville, and others—An agricultural survey, townships of Ithaca, Dryden, Danby, and Lansing (Tompkins County), and Livingston, Jefferson, and other counties.
- E. C. Young—A study of the movement of farm population.

Animal Husbandry

In the Department of Animal Husbandry the following paper has been published:

- M. W. Harper—Raising colts. Cornell Univ. Agr. Exp. Sta. Bul. 403. 1921.
This bulletin reports a study of thirty-four mares and the colts reared from them during the period from 1909 to 1919. The mares were used for the work on the farms of the New York State College of Agriculture and for hauling coal. A record of the different items of cost in growing these colts is given, together with some of the practices that were found best.

The following paper is ready for publication:

- L. A. Maynard and F. M. Fronda—The relative growth-promoting value of the protein of coconut oil meal, and of combinations of it with protein from various other feeding stuffs.

The following work is under way:

- M. W. Harper—Grain for work horses.
- M. W. Harper and George Haines—Maximum hay and minimum grain for the work horse.
- M. W. Harper and M. S. Morton—Silage for raising colts.
- R. B. Hinman—Protein supplements for swine. The place of protein supplements of animal origin in the feeding of swine in New York State.
Salt mixtures for sheep. An attempt to arrange some mixture of salts which, if kept before sheep at all times, may take the place of drenching for ridding sheep of worms.
The value of buckwheat middlings for feeding growing shot on pasture. An attempt to see how nearly buckwheat middlings may be safely substituted for wheat middlings in feeding growing shot on pasture.

- L. A. Maynard and F. M. Fronda—The combination of feeding stuffs to get protein mixtures of high quality. A study of the relative growth-producing value of the protein of various feeds, singly and in combination, to establish mixtures of high quality.
- L. A. Maynard and L. C. Norris—A substitute for skimmilk for the rearing of calves. A study to establish a formula of proved value for a milk substitute, and to determine the general principles, chemical, physical, and physiological, on which the formulation of a substitute must be based.
- L. A. Maynard and G. Toupin—The relation of the vitamine content of the feed to the vitamine content of the milk produced. A study of the relative efficiency of milk produced on vitamine-rich and vitamine-poor rations, the efficiency being measured by growth studies with white rats.
- E. S. Savage, L. A. Maynard, H. P. Beals, and C. H. Merchant—A study of types of corn for silage. The loss of nutrients in the process of silage making. The comparative feeding value of corn silage from types of corn ranging from a type not maturing ears to a type producing practically mature grain in the latitude of southern New York.

Botany

In the Department of Botany the following papers have been published:

- J. M. Brannon—A simple method for growing plants. *Amer. journ. bot.* 8:176-178. 1921.
In this article is described a simple method of growing plants under sterile conditions, which is especially valuable to a person growing higher plants in the dark since by its use they will grow for several months.
- O. F. Curtis—The upward translocation of foods in woody plants. II. Is there normally an upward transfer of storage foods from the roots or trunk to the growing shoots? *Amer. journ. bot.* 7:286-295. 1920.
From a series of ringing experiments, data were obtained indicating that, contrary to commonly accepted ideas, very little of the food that is manufactured in the leaves and stored in the roots, the trunk, and the larger branches moves up from these storage organs to be used by the growing shoots. Evidence was obtained indicating that, after a few leaves have been produced from foods stored in the smaller twigs and branches, further growth of shoots and leaves occurs at the expense, not of the stored foods brought from a distance, but of the food newly manufactured in the leaves already produced.
- L. Knudson—The secretion of invertase by plant roots. *Amer. journ. bot.* 7:371-379. 1920.
Evidence is presented showing that Canada field pea and corn grown in the presence of sucrose under sterile conditions cause an increase in reducing sugar in the culture solution. Since no enzyme could be detected in the solution, it is suggested that the reducing sugars were excreted by the roots.
- L. Knudson and S. Ginsburg—Suggestions with respect to the measurement of osmotic pressure. *Amer. journ. bot.* 8:164-170. 1921.
Data are presented indicating that saps of differing concentrations are obtained when widely differing pressures are used in extracting the sap from frozen tissue, while little difference in concentration of sap was found when sap from tissue frozen in salt and ice was compared with that from tissue frozen in liquid air. Some comparisons are made between the plasmolytic and cryoscopic methods of determining sap concentrations.
- D. Reddick—A fourth *Phytophthora* disease of tomatoes. *Phytopathology* 10:528-534. 1920.
A disease of tomato is described which is known to occur only in the greenhouses at Cornell University and in fields of the immediate vicinity. Stems of plants of all ages are girdled, a blight of foliage may occur, and fruits may be destroyed. A comparison is made with the three other diseases of tomato caused by species of *Phytophthora*. This disease is different and the fungus causing it does not seem to have been described heretofore. The

biology of the fungus leads to the belief that the disease has the potentiality of considerable destructiveness. Plants which are in the most thriving condition are the most readily destroyed; those that are making very poor growth become infected but do not succumb. The fungus grows and produces cankers on cucumbers, a crop often grown in rotation with tomatoes.

- L. W. Sharp—Somatic chromosomes in *Tradescantia*. Amer. journ. bot. 7: 341-355. 1920.

This is a detailed study of the behavior of the chromosomes in vegetative cell division, with special reference to chromosome division, chromosome reduction, and the cytological evidence for the postulated units of inheritance.

- F. B. Wann—The fixation of free nitrogen by green plants. Amer. journ. bot. 9: 1-29. 1921.

Seven species of green algae have been isolated in pure culture and grown in the presence of nitrate, ammonia, and amino-nitrogen compounds, both in the presence and in the absence of glucose. At least five species, belonging to the genera *Chlorella*, *Stichococcus*, and others, in the presence of glucose fixed considerable quantities of free nitrogen amounting in some cases to over 50 per cent increase in total nitrogen. In one species, in the absence of glucose with nitrates, or in the absence of nitrates with glucose, a loss in total nitrogen occurred.

- K. M. Wiegand—Additional notes on *Amelanchier*. *Rhodora* 22:146-151. 1920.

This is a record of changes in the author's conception of the eastern species of shadbush and June berries since his revision of this group in 1912. One old species is resurrected, one form is raised to specific rank, and two species are described as new. Critical notes and descriptions are given. Two of the species are found in the Cayuga Lake Basin.

Amelanchier Amabilis, a new name. *Rhodora* 23: 48. 1921.

A new name is given to a shadbush whose name previously was *intermedia*.

The genus *Echinochloa* in North America. *Rhodora* 23: 49-65. 1921.

This is a systematic revision of the farm-yard grasses of North America. Keys, critical notes, and descriptions are given. One species, eight varieties, and two forms are described as new.

- K. M. Wiegand and M. L. Fernald—Studies of some boreal American *Cerastium*s of the section *Orthodon*. *Rhodora* 22:169-179. 1920.

Critical notes and descriptions concerning the boreal mouse-ear chick-weeds with key, nomenclature, soil notes, and distribution. One species, one variety, and one form are described as new.

The following papers are ready for publication:

- J. M. Brannon—Utilization of dextrose and fructose by fungi.
Utilization of dextrose and fructose by higher plants.
H. E. Knowlton—Studies in pollen, with special reference to longevity.
W. C. Muenscher—The relation between transpiration and the absorption and distribution of mineral nutrients.
L. W. Sharp—An introduction to cytology. A textbook of cytology and its interrelation with genetics.
T. W. Turner—Studies as to the mechanism of certain mineral salts in altering the ratio of top growth to root growth in seed plants.
F. B. Wann and W. C. Muenscher—*Myxomycetes* of Cayuga Lake Basin.
K. M. Wiegand—The protection of nectar and pollen in flowers.

The following work is under way:

- J. M. Brannon—The effect of plant extracts on fungi and higher plants.
H. H. Clum—Studies on the rest period in plants.
O. F. Curtis—Effects of various factors, especially nutrients and water supply, on root growth, both absolute growth and growth relative to that of tops.
Tissues concerned in the upward transfer of foods and nutrients in plants and the mechanism and factors affecting this movement.
O. F. Curtis and Miss A. L. Kibbe—Effect of water supply on root growth, both absolute growth and growth relative to tops.
O. F. Curtis and Miss E. I. Fernald—Studies on polarity and inhibition.

- F. Dickson—The effect of some fungi parasitic upon orchid roots on the germination of orchid seeds.
- A. J. Eames—Anatomy and morphology of angiosperm flowers.
- Miss M. J. Fisher—Anatomy of flowers of the Salicaceae.
- J. J. Grimm—Methods of measuring photosynthesis under field conditions, and effect of water supply, accumulation of products, and other factors on the process.
- K. C. Hyde—A gall disease of *Populus*.
- L. Knudson—Organic nutrition of plants. The possibility of the utilization of soil organic matter.
Function of different sugars in plant metabolism.
Germination studies with seed of orchids.
- L. Knudson and Edwin Hopkins (University of Missouri)—Secretion of enzymes by fungi, and influence of carbohydrates on enzyme production.
Influence of certain carbohydrates on secretion of amylase by *Botrytis* sp.
- W. C. Muenscher—The possibility of the utilization of inorganic nitrogen (NO_3 and NH_4) by green plants (algae) in the absence of light.
- L. F. Randolph—A cytological study of the cells of various races of maize, with special reference to the origin and behavior of chloroplasts.
- D. Reddick—The conditions of parasitism.
External conditions affecting resistance or susceptibility. Interrelations, etcera.
Mosaic disease of beans and other legumes: nature, cause, control.
- J. R. Schramm—Investigation of the question, Is there a quantitative relationship between nitrate nitrogen utilized and free nitrogen fixed in algae?
- G. H. Smith—Anatomy of flowers of the Ranales.
- Miss M. E. Stratton—A study of nuclear phenomena in the red algae *Batrachospermum*.
- F. B. Wann—Fixation of free nitrogen by algae.
- F. Weiss—Relation of external conditions to infection and development of the potato wart disease caused by *Chrysophylctis*.
- K. M. Wiegand—Revision of the genus *Oxalis*. A critical study of our eastern species of wood sorrel.
- K. M. Wiegand and A. J. Eames—Flora of the Cayuga Lake Basin. A critical taxonomic, geographic, and soil study of our native plants.
- K. M. Wiegand and M. L. Fernald—Survey of the flora of Newfoundland, with preparation of a flora.
- C. L. Wilson—A study of angiosperm meristem.

Dairy Industry

In the Department of Dairy Industry the following papers are ready for publication:

- W. W. Fisk and W. V. Price—Clarification of milk for cheese making.
- G. C. Supplee, W. A. Whiting, and P. A. Downs—Variations in bacteria counts from milk as affected by media and incubation temperature.

The following work is under way:

- R. W. Bell—The apparent acidity of fresh milk and the detection of small amounts of real acidity.
- H. C. Jackson—Neutralization of cream for butter making.
Setting up and operation of condensed milk pans.
- T. J. McInerney—A comparison of the direct microscopic method and the plate method for counting bacteria in milk.
- H. B. Neville—A study of some of the effects of bacterial action and the heating of milk on the milk proteins.
A study of the proteolytic compounds in milk.
- E. E. Pittman—Bacterial content of creamery waste.
- W. V. Price—A consideration of the effect of the neutralization of the acidity in cream upon the analysis of the resulting butter, upon the acidity of the butter while held in storage, and upon some of the constants of butter.

- H. C. Troy—The distribution of moisture in cheddar cheese and changes in its percentage.
 Variations in analytical weighings due to differences in temperature.
- H. C. Troy and T. J. McInerney—A comparison of the Majonnier method and the Babcock method for determining the percentage of fat in different dairy products.
- W. A. Whiting—The bacterial flora of milk utensils with reference to the clumping of bacteria in milk.

Entomology

In the Department of Entomology the following papers have been published:

- A. A. Allen—Banding bats. Amer. journ. mammalogy, March, 1921.
 This paper describes a method of marking bats for the purpose of identification in a study of habits.
- J. C. Bradley—Taxonomy of Masaridae (of the world). Univ. California pubs. 1918.
 Nyssonidae. Amer. Ent. Soc. Trans. 46:113-132. 1920.
- P. W. Claassen—Are we abusing our water resources? Sci. Amer. 134:—. 1921.
 Dairy wastes and fish food. New York State Conservation Commission. Conservationist 3:104-106. 1920.
- G. W. Herrick and J. D. Detwiler—Notes on some little-known pests of red clover. Journ. econ. ent. 12:206-209. 1919.
 The life history, habits, distribution, and control of the clover head weevil (*Phytonomus meles* Fab.), the lesser clover leaf weevil (*Phytonomus nigrirostris* Fab.), and the clover seed weevil (*Tychius picirostris* Fab.), are discussed. Natural and artificial controls also are dealt with.
- S. W. Frost—Two species of *Pegomyia* mining the leaves of dock. Journ. agr. res. 16:229-243. 1919.
 This is a detailed account of the life history, habits, and ecological relations of two little-known dipterous leaf miners which live in the leaves of various species of *Rumex*.
- L. A. Hausman—The smallest animal in existence. Sci. Amer. monthly, March, 1921.
 This paper gives an account of a minute protozoan.
 Hair coloration in animals. Sci. Amer. monthly, March, 1921.
 This is a popular explanation of the manner in which pigment is distributed in the hairs of various animals.
 The vibratile oral membranes of *Glaucoma scintillans*. Amer. nat. 54:427-434. 1920.
 This gives a description of a peculiar membrane around the mouth of a protozoan.
- G. W. Herrick and C. H. Hadley—A study of habits, activities, and injuries of the clover leaf weevil, with the hope of finding effective methods of control. Ent. Soc. Amer. Ann. 13:101-107. 1920.
- O. A. Johannsen—The first instar of *Wohlfahrtia vigil*. Journ. parasitol. 7:154. 1921.
 This is a description of the first stage of a parasitic fly causing myiasis in man.
Oxycera tenuicornis or *Euparyphus tenuicornis*? Ent. mo. mag. 57:140. 1921.
 This paper deals with a question of the synonymy of an English fly.
- C. W. Muesebeck—A revision of the North American species of ichneumon flies belonging to the genus *Apanteles*. U. S. Nat. Mus. Proc. 58:483-576. 1920.
 This is a complete revision of the genus *Apanteles*, which is a very important group of insects parasitic on many of our most important insect pests. There is included also a complete statement of the host relationships and life-history data where they are known. The author has included a great amount of biological data gathered from his own observations and rearing work.

- W. H. Wellhouse—Hawthorn lace-bug. Journ. econ. ent. **12**: 441-446. 1919.

This paper gives the life history and a description of a small bug which lives in colonies and sucks the sap from the leaves of several species of *Crataegus*, causing the leaves to turn brown and drop.

- Wild hawthorns as hosts of apple, pear, and quince pests. Journ. econ. ent. **13**: 388-391. 1920.

This is a study of the insects now found on native hawthorns, which appear only occasionally on the apple, the pear, or the quince as yet but may become pests on them later.

- The hawthorn blossom weevil. Ent. Soc. Amer. Ann. **14**:—, 1921.

This gives an account of the life history and habits of a weevil which breeds in the blossom buds of American hawthorns and destroys many of the buds.

The following papers are ready for publication:

- J. L. Buys—The gonapophyses of the Cicadellidae.
 P. W. Claassen—Typha insects.
 J. D. Detwiller—The ventral prothoracic gland of the red-humped apple caterpillar, *Schizura concinna* S. & A.
 E. H. Dusham—The painted hickory borer.
 M. J. Fisher—The genus *Acroneuria* of stone flies.
 Miss L. Florence—The hog louse, *Haematopinus suis* Linné: its biology, anatomy, and histology.
 W. T. M. Forbes—The Lepidoptera of New York and the neighboring States.
 I. M. Hawley—Insects and other animal pests injurious to field beans in New York.
 H. C. Hockett—The ovipositor in the Anthomyiinae.
 O. A. Johannsen—The genus *Diamesa* of Meigen.
 A seed potato maggot (*Hylemyia trichodactyla*).
 Eggs of the potato flea beetle (*Epitrix cucumeris*).
 Stratiomyiid larvae and puparia of the northeastern States.
 H. H. Knight—Studies on insects affecting the fruit of the apple, with particular reference to the characteristics of the resulting scars.
 R. W. Leiby—Polyembryony.
 J. S. Latta—The structure of the head in *Acroneuria*.
 A. E. Lundie—A biologic study of the parasites of the woolly aphid of the apple, with special reference to their introduction into Southern Africa.
 H. G. Mank—A contribution to the knowledge of Staphylinidae.
 C. F. W. Muesebeck—Systematic revision of certain groups of parasitic Hymenoptera.
 H. E. Murphy—Metamorphosis of the mouth parts of Ephemeridae.
 C. Ping—The biology of *Ephydra subopaca* Loew.
 R. C. Smith—The biology of the Chrysopidae.
 J. R. Traver—Ecology of the may fly *Blasturus cupidus*.
 I. H. Vogel—A study of *Ceutorhynchus quadridens*, an important pest on cabbage seeds produced on Long Island.
 R. L. Webster—Fumigation of deciduous fruit trees with hydrogen cyanide, with special reference to the pear psylla.
 W. H. Wellhouse—The insect fauna of the genus *Crataegus*.
 B. P. Young—Attachment of the abdomen to the thorax in Diptera.
- The following work is under way:
- A. A. Allen—The artificial propagation of the canvasback, the wood duck, the pintail and teal, the bobwhite and California quail, the golden and Amherst pheasants, the ruffed grouse, and other ornamental waterfowl and game birds.
 Life histories of birds of eastern North America.
 Methods of attracting birds.
 The migration of birds.
 The banding of birds and bats.
 F. O. Bain—Anatomy of the larva of the codling moth.
 J. C. Bradley—Revision of Thynnidae of Chile.
 Scoliidae of Belgian Congo.

- A. Burroughs—A study of the apple-tree borers and their control with the new insecticide paradichlorobenzene.
- W. H. Brittain—A study of *Psylla mali*, the apple sucker, a recently discovered pest in North America.
- J. L. Buys—The Cicadellidae of New York.
- P. W. Claassen and J. G. Needham—Studies in milk wastes: (1) For the utilization of wastes for the production of fish food; (2) Effect of milk waste on fish and other aquatic life.
- The utilization of *Typha angustifolia* and *T. latifolia* for heat insulation and other commercial products.
- G. C. Embury (in cooperation with the New Jersey Fish and Game Commission)—Breeding disease-resistant brook trout.
- Breeding experiments looking toward the production of a strain of warm-water trout that may be raised in an ordinary farm fish-pond.
- Breeding and cultural experiment with bullhead catfish.
- A. E. Emerson—The classification of South American termites.
- Biology of the termites.
- S. W. Frost—A biological study of the dipterous leaf miners.
- G. H. Griswold—A biologic study of the oyster-shell bark louse.
- R. D. Harwood—A study of the dogwood *Chionaspis*, with special reference to its control.
- L. A. Hausman—Chlamydodon, a marine ciliate protozoan.
- Gymnostomine protozoa.
- G. W. Herrick—The life history and habits of the maple leaf cutter.
- The activities and injuries of the cloaked knotty-horn beetle (*Desmocirus palliatus*).
- G. W. Herrick and G. H. Griswold—A detailed study of the distribution, injuries, life history, and habits of the European elm scale, with special reference to its control.
- H. C. Huckett—The control of the cabbage maggot with corrosive sublimate.
- Taxonomy of the Anthomyiidae.
- O. A. Johannsen—Economical production of living food for fish.
- Insect parasites of man and animals.
- Potato insects.
- Problems in the embryology of insects (parthenogenesis, paedogenesis, and so forth).
- C. W. Leister—The natural food of waterfowl.
- The weed beds of upper Cayuga Lake.
- R. Matheson—A study of the parasitism of *Crioceris asparagi* by *Tetrastichus asparagi*.
- A study of the Ixodidae (ticks) of New York State.
- A study of the fleas (Siphonaptera) of New York State.
- R. Matheson and R. C. Shannon—A study of the mosquito fauna of the Cayuga Lake Basin.
- R. Matheson and L. S. West—A catalogue, both host and parasite, of the parasites of insects.
- C. F. W. Muesebeck—The biological control of injurious insect species, with particular reference to insect parasitism.
- J. G. Needham, Hazel E. Branch, and P. W. Claassen—Utilization of bloodworms in the removal of milk waste.
- J. G. Needham and P. W. Claassen—Monograph of North American Plecoptera.
- J. G. Needham, Laura Florence, and A. W. Clark—Conversion of vegetable pulp into fish food through the agency of herbivorous fly larvae (larvae of Muscina, and others).
- R. C. Shannon—A biological and systematic study of the Tabanidae, a very important family of blood-sucking flies.
- C. K. Sibley—The caddice worms of lake beds.
- W. H. Wellhouse—Insect enemies of wild plants which are closely related to the cultivated pomaceous fruits.
- Anatomy of the larva of the crane fly *Tipula abdominalis*.
- L. P. Wehrle—A biologic study of the clover seed caterpillar, with a consideration of methods of control.

- A study of the life history, habits, and methods of control of certain clover pests, especially the clover seed midge.
- L. S. West—A study of the Tachinidae of the Cayuga Lake Basin.
The respiratory system of *Osmoderma socialis*.
- C. F. Wu—The biology of the stone-fly genus *Nemora*.
The histology of the nervous system of *Osmoderma socialis*.

Farm Crops

In the Department of Farm Crops the following papers have been published:

- H. C. Thompson—Effects of cultivation on soil moisture and on yields of certain vegetables. Amer. Soc. Hort. Sci. Proc. 17: 155-161. 1920.
This is a preliminary report of some experiments comparing cultivation with merely cutting the weeds, as to the effect on the growth of certain truck crops.
- P. Work—Effects of nitrate of soda on the nutrition of the tomato. Amer. Soc. Hort. Sci. Proc. 17:138-146. 1920.
This is a preliminary report on some pot experiments to study the effect of nitrogen on the fruitfulness of the tomato. Analyses for nitrogen and carbohydrates were made, and the influence on fruitfulness of the carbohydrate-nitrogen ratio was studied.

The following papers are ready for publication:

- E. V. Hardenburg—A study by the crop survey method of factors influencing the yield of potatoes.
- R. G. Wiggans—A classification of the cultivated varieties of barley.

The following work is under way:

- F. A. Carlson—An investigation of the differences on root habits of species of alfalfa which have different degrees of hardness.
- E. V. Hardenburg—A study of field beans as to types and varieties.
A study of potato types as to regional adaptation in New York.
A potato variety and type test.
- H. S. Mills—A study by the survey method of the factors influencing yields, cost of production, and returns, of canning crops.
- H. W. Schneck—Training of greenhouse cucumbers.
Greenhouse tomato variety study.
Strain tests of the Grand Rapids variety of greenhouse lettuce.
- H. W. Schneck and A. C. Thompson—Pollination of greenhouse tomatoes.
- H. C. Thompson—The principles of intertillage. A study of the effects of cultivation on soil moisture, root development, and yields of vegetables.
A study of the causes of premature development of seed stalks of celery.
A study of the effects of pruning and staking tomatoes, on yield, earliness, quality, and cost of growing, also a study of the causes of the effects produced.
- H. C. Thompson and F. O. Underwood—A study of the effects of removal of suckers of sweet corn, on earliness, size of ears, total yield, and other conditions.
A study of commercial strains of Bonny Best and Chalks Jewel tomatoes, and Copenhagen market cabbage, to locate superior strains for all desirable qualities.
- H. C. Thompson and P. Work—Maintenance of fertility for production of vegetable and market-garden crops.
- P. Work—Nutrition of the tomato. Studies intended to throw light upon conditions within the plant, correlated with certain external treatments and the response of the plants to those treatments. At present confined to nitrogen nutrition.
Systematic study of celery varieties. Classifications and descriptions of existing varieties of celery.

- R. G. Wiggins—A study of various rotations on continued production by soils of different types.

A study of silage corn and supplementary silage crops, especially sunflowers and soybeans, including such factors as the stage at which corn is most valuable for silage purposes to the pound of dry matter; the variety which will produce the greatest amount of dry matter to the acre; the effect of planting date on the development and yield of corn; the effect of an irregular stand on the yield of corn; the productivity and adaptations of sunflowers for silage purposes; the varieties of soybeans best suited for silage purposes.

Yield tests of various grass and clover mixtures.

Variety tests of corn, oats, wheat, clover, and alfalfa.

Studies as to the best treatment and the value of pastures.

Floriculture

In the Department of Floriculture the following work is under way:

- A. C. Beal—Variety tests of winter-flowering and garden sweet peas.
Variety tests of gladioli.
- A. C. Beal and S. C. Hubbard—Rose studies: (1) A study of the hardiness and adaptability of different varieties and types of roses. (2) A study of stocks for roses. (3) A study of the development of an American type of roses. (4) Methods of winter protection, and cultural methods.
- A. C. Beal, A. W. W. Sand, and S. C. Hubbard—Peony studies.
- Lua A. Minns—Species, types, and varieties of hardy primulas.
- A. W. W. Sand—Variety tests of pogon irises.
- C. L. Thayer—Variety tests of perennial phlox.

Forestry

In the Department of Forestry the following papers have been published:

- J. S. Everitt—Working plan for a communal forest for the town of Ithaca, New York. Cornell Univ. Agr. Exp. Sta. Bul. 404. 1921.
- This is the report of a survey of a tract of land near the city of Ithaca, together with recommendations for its management as a communal forest.
- A. B. Recknagel—Second-growth hardwoods in the Adirondacks. Journ. forestry 19: 129-130. 1921.

The results of some measurements of the growth on hardwood land cut clear from twenty-five to thirty years ago, are given in this paper.

The following work is under way:

- John Bentley, jr.—Volume, growth, and yield studies. Preparation of yield tables for second-growth hardwoods in the Adirondacks.

- G. H. Collingwood (assisted by other members of the departmental staff)—The effect of cleanings, thinnings, and improvement cuttings on the volume growth and sugar yield of stands of hard maple.

- C. H. Guise—Volume, growth, and yield studies. Sample plots in second-growth stands of mixed hardwoods at Mapleton, New York.

Records of the growth and yield of white pine, scotch pine, red pine, and norway spruce in planted stands, and of evergreens and hardwoods in natural stands, are being kept on sample plots in various sections of the State by members of the departmental staff in cooperation.

Periods required to secure penetration of creosote oil in fence posts of common species of wood when treated by the hot-bath and the cold-bath method.

- A. B. Recknagel—Relative durability of creosoted fence posts treated by (1) brushing, (2) dipping, (3) the open-tank method of creosoting, and set in an experimental line in one of the fences bounding a university woodlot.
The location, supply, and development of the chief pulpwood species in the United States.
- S. N. Spring—Fertilizing in forest nursery practice. Preliminary experiments in fertilizing scotch pine in seedbed plots.
Eradication of weeds from seedbeds and transplant beds, and in forest plantations, by chemical sprays.
Seed production of white pine in Ithaca regions.

Landscape Art

In the Department of Landscape Art the following work is being done:

- R. W. Curtis, A. W. W. Sand, and H. A. Pratt—A study for the purpose of establishing a foliage key to landscape plants.
- E. G. Davis—A study of the history of landscape art.
- J. P. Porter—Landscape architecture: its relation and application to the rural schools of New York.
A study of the ferns of New York in their relation to landscape art.
- Miss M. I. Potter—The history of landscape art in England.

Meteorology

In the Department of Meteorology the following work is under way:

- W. M. Wilson—Studies in evaporation.
- W. M. Wilson and R. A. Mordoff—The relation of the climate of New York to the agricultural industries of the State.

Plant Breeding

In the Department of Plant Breeding the following papers have been published:

- R. A. Emerson—The genetic relations of plant colors in maize. Cornell Univ. Agr. Exp. Sta. Memoir 39. 1921.
Descriptions, illustrations, and discussions of genetic and environmental relations of the six major color types of maize, purple, sun red, dilute purple, dilute sun red, brown, and green (colorless), and of the subtypes, weak purple, weak sun red, green-anthered purple, green-anthered sun red, and five genotypes of green. Sun red and dilute sun red types are shown to be dependent on light for development, while purple, dilute purple, and brown develop characteristic colors in local darkness. Diversities of temperature and soil moisture without direct effect on maize color. Infertile soil intensifies development of purple-red series (anthacyanins) but has no effect on brown (flavonol) pigment. Deficiency of nitrogen, and probably also of phosphorus, responsible for effect of infertile soils. Accumulation of carbohydrates associated with strong color development. Genetic behavior of the several color types interpreted on basis of two allelomorph pairs and two series of multiple allelomorphs. Two of the four also involved in development of aleurone color. One pair of allelomorphs linked with yellow endosperm and one series of allelomorphs with liguleless leaf.
- William H. Eyster—Heritable characters in maize. VI. Zigzag culm. Journ. hered. 11: 349-357. 1920.
The abnormality known as zigzag culm is described and illustrated, and data bearing on its mode of inheritance are given.
- G. P. McRostie—Inheritance of disease resistance in the common bean. Amer. Soc. Agron. Journ. 13: 15-32. 1920.
Data are presented with respect to the mode of inheritance of resistance and susceptibility of beans to anthracnose, mosaic, and dry root rot. Resist-

ance to anthracnose is a mendelian dominant. One factor pair differentiates between resistance and susceptibility to the *alpha* strain of anthracnose, and one to the *beta* strain, the two pairs being apparently independent of each other in inheritance. Susceptibility to mosaic and to dry root rot are dominant, and the data indicate that at least two complementary factor pairs are concerned in the inheritance of susceptibility to each of the diseases.

The following papers are ready for publication:

- E. G. Anderson—The inheritance of salmon silk color in maize.
The inheritance of pericarp colors in maize.
- Sarkis Boshnakian—The genetics of squareheadedness and of density in wheat, and the relation of these to other characters.
The relation of the spelt factor in wheat to rachis internode length.
- R. A. Emerson—Genetic evidence of aberrant chromosome behavior in maize endosperm.
Heritable characters in maize: crinkly leaf.
- R. A. Emerson and S. H. Emerson—Genetic interrelations of two andromonoecious types of maize, dwarf and anther ear.
- R. A. Emerson and C. B. Hutchison—The relative frequency of crossing-over in microspore and in megaspore development in maize.
- L. A. Eyster—Heritable characters in maize: male sterile.
- W. H. Eyster—The linkage relations between the factors for tunicate ear and starchy-sugary endosperm in maize.
- C. B. Hutchison—Heritable characters in maize: shrunken endosperm.
Heritable variations in maize.
- C. H. Myers, H. H. Love, and F. P. Bussell—Production of new strains of corn for New York.

The following work is under way:

- F. P. Bussell—Breeding barley.
- F. P. Bussell, R. A. Emerson, C. B. Hutchison, and C. H. Myers—Breeding corn for grain and silage.
- R. A. Emerson—Genetic studies in corn, with special reference to linkage.
Breeding field and garden beans for disease resistance. (In cooperation with the Department of Plant Pathology.)
- A. C. Fraser—Mendelian studies with *Aquilegia* and corn.
Breeding hardy roses. (In cooperation with the Department of Floriculture.)
- C. B. Hutchison—Genetic studies of corn and flax.
- H. H. Love—Mendelian studies with wheat and oats.
Selection within pure lines of oats and beans.
Variations in the common daisy.
Breeding wheat, oats, and rye. (In cooperation with the Cereal Office of the U. S. Department of Agriculture.)
- C. H. Myers—Breeding timothy.
Tuber-selection studies with potatoes.
Breeding cabbage.
Inheritance of variations induced by difference in nutrition of wheat.

Plant Pathology

In the Department of Plant Pathology the following papers have been published:

- F. M. Blodgett and K. Fernow—Testing seed potatoes for mosaic and leaf-roll. *Phytopathology* 11:58-59. 1921.
- W. H. Burkholder—The bacterial blight of the bean: a systemic disease. *Phytopathology* 11: 61-69. 1921.

It is pointed out that the bacteria traveling in the xylem vessels may reach all parts of the host plant and produce lesions in any part above ground. The relation of this systemic infection to the various symptoms of the disease and to the control measures is discussed.

- C. E. Chardon—A list of the Pyrenomycetes of Porto Rico collected by H. H. Whetzel and E. W. Olive. *Mycologia* 12:316-321. 1920.

A list is given of a total of 112 specimens, representing 65 species.

- H. M. Fitzpatrick—Monograph of the Coryneliaceae. *Mycologia* 12:206-267. 1920.

A taxonomic contribution to our knowledge of the group of fungi known as the Pyrenomycetes. Practically all of the species treated are parasitic, and one, occurring on white pine, is destructive and of economic importance.

- R. S. Kirby and H. E. Thomas—The take-all disease of wheat in New York State. *Science* 51:368-369. 1920.

This paper reports and briefly describes a disease of wheat indistinguishable from the destructive "take-all" disease (caused by *Ophiobolus*) of Europe and Australia. It is the first authentic record of this disease in America.

- L. M. Massey—Experimental data on losses due to crown-canker of rose. *Phytopathology* 11:125-134. 1921.

Losses are to be measured by the decrease in yields of blossoms, not by the death of the host. A decrease of about ten blossoms to each plant represents the annual loss when plants are grown in infested soil.

The following papers are ready for publication:

- M. F. Barrus—Bean anthracnose.

- C. E. Chardon—A contribution to our knowledge of the Pyrenomycetes of Porto Rico.

- E. F. Hopkins—The Botrytis blight of tulips.

The following work is under way:

- M. F. Barrus—Discovery of the cause, distribution, and control of little-known potato diseases.

- F. M. Blodgett and K. H. Fernow—A study of the leaf-roll and mosaic diseases of potatoes, particularly the relation of potato mosaic to mosaic diseases of other plants, the causes of mosaic and leaf-roll diseases of potatoes, the influence of various factors on the symptoms of these diseases, and the control of these diseases by roguing, isolation of disease-free strains, and other methods.

- O. C. Boyd—The control of *Rhizoctonia* of the potato.

The effect of various dusts in comparison with bordeaux spray, on early blight, late blight, and tipburn of potato.

- W. H. Burkholder—The bacterial blight of the bean. The effect of environmental factors on the disease, the nature of the causal organism, and the production of disease-resistant stock.

The dry root-rot of the bean: (1) The nature and cause of the disease; (2) The effect of soil environment on the disease.

- C. E. Chardon—Pyrenomycetes of Porto Rico.

- C. Chupp—Bacterial disease of lima beans: life history and possible means of control.

- G. L. Clapp—The determination of the cause of resistance and susceptibility of different species of pears to blight. The work is directed along morphological and microchemical lines.

- F. Dickson—A complete study of *Sclerotinia libertiana* (Fuckel) as a plant parasite.

- H. W. Dye—The comparative effectiveness of copper dust and spray for the control of celery blights.

A monographic study of two lettuce diseases—the bottom rot and the stunt.

- K. H. Fernow—To determine the cause of the spots in potato fields commonly attributed to lightning. These injuries are sometimes attributed to a Phoma which commonly occurs on the dead plants. Work is being conducted on the effect of electric currents on plants, and on inoculations with the fungi found associated with the dead plants.

Transmission of the mosaic diseases. To determine, first, by what means the mosaics and allied diseases may be transmitted, and secondly, to what extent they can be transferred from one host species to another.

- H. W. Fitch—Some phases of dusting in relation to the control of fruit diseases.
 H. M. Fitzpatrick—Morphological and taxonomic studies of *Pyrenomyces*. At present chiefly concerned with the genus *Nitschkia* and its relatives.
 L. O. Gratz—The determination of the cause, effect on host, control, and importance of wire stem on cabbage seedlings occurring at Eden Valley, New York.
 E. E. Honey—Apple flyspecks. A study of the morphology and taxonomy of the causal organisms.

The brown-rot disease of orchard fruits, with special reference to the etiology of the disease.

- R. S. Kirby—*Fusarium* root, ear, and stalk rots of corn in New York State: causal organisms; life history; control.
 L. M. Massey—Corm rots of *gladiolus*. Life history studies; nature of the rots; control. Investigation of the most important diseases (at least three) of this plant.

Diseases of the rose. An investigation of the more important diseases under glass and out of doors. Life history studies; temperature relations; control.

- G. P. McRostie, R. A. Emerson, and W. H. Burkholder—The breeding of varieties of beans resistant to the various diseases of the bean.
 A. G. Newhall—Study of the nature, cause, and control of lettuce tipburn, particularly with reference to the relation of weather, associated organisms, and fertilizers; also varietal resistance.

To determine the nature and seriousness of the onion pink-root disease; control measures, including soil treatment and selection for resistance.

- F. R. Perry—*Fusarium* wilt of potatoes.
 H. E. Thomas—Study of resistance of pears to blight.
 H. E. Thomas and R. S. Kirby—Investigation of take-all of wheat, presumably caused by a species of *Ophiobolus*.
 I. H. Vogel—Cauliflower diseases on Long Island; causes and nature of the diseases, and extent of losses due to them. Diseases of cabbage affecting the seed-growing industry; methods of control.
 H. H. Whetzel—General taxonomic study of forms in the genera *Botrytis* and *Sclerotinia*, especially with respect to the inter-relationships of these forms, host ranges, and biological strains.

Sexuality in the genera *Botrytis* and *Sclerotinia*, and the occurrence of dioecious forms.

Studies on *Botrytis* and *Sclerotinia* diseases of plants. The following partially completed: *Botrytis* diseases of peony; *Botrytis* blight of golden seal; *Sclerotinia* minor stem rot.

Phytophthora bud rot of Bermuda lilies.

- R. P. White—Investigations of pea diseases: (1) *Fusarium* root rot; (2) *Rhizoctonia* collar rot.

Investigation of tomato diseases: (1) Influence of soil moisture on blossom end rot; (2) Nature and cause of the stripe-disease.

Pomology

In the Department of Pomology the following papers have been published:

- W. H. Chandler—Some responses of bush fruits to fertilizers. *Amer. Soc. Hort. Sci. Proc.* 17:201-204. 1921.

This is a preliminary report on some experiments with fertilizers for bush fruits. Gooseberries, currants, blackberries, and black and red raspberries were growing on the same soil type and received the same treatments. Marked response to nitrogen was shown by red raspberries, and some by black raspberries and gooseberries, but no perceptible response was shown by blackberries and currants. None of these fruits showed a measurable response to potassium or phosphorus, though maize growing on the same land showed a very marked response to phosphorus.

- A. J. Heinicke—The seed content and the position of the fruit as factors influencing stippen of apples. Amer. Soc. Hort. Sci. Proc. 17:225-232. 1921.

Data and results of observation are presented which indicate that concerning the occurrence of that form of the physiological disease called also *bitter pit*, or *Baldwin spot*, which appears before harvesting the fruit, the following is true: (1) The lateral fruits of a cluster are more frequently affected than the central apples. (2) Fruits on spurs near the end of a twig are less frequently spotted than those nearer the basal part. (3) Apples on weak wood are more subject to bitter pit than those on strong branches; trees invigorated by cultivation or by the application of nitrate have fewer fruits with stippen than trees in sod. (4) Bitter pit occurs most frequently in the smaller, or the few-seeded lateral, apples of a cluster; however, central apples with few seeds often show less pitting than lateral apples with many seeds; the disease is usually found on the side of the apple exposed to the sun, but in case of entirely shaded fruits the spotted side corresponds to the cavity with poor seeds or none at all, while the normal part is found on the side with many plump seeds; the form of bitter pit which develops after harvesting is more frequent on the large, many-seeded side of the fruit. (5) Conditions which seem to inhibit the development of stippen before harvesting are often associated with the occurrence of water core, but the same conditions which favor the development of water core might also favor the occurrence of bitter pit, which manifests itself after the fruit is picked; the form of stippen that appears while the fruit is still on the tree, and the more commonly observed form which appears after harvesting, are both regarded as drought or starvation spots due to the failure to receive water and other nutrients which are needed to continue growth or to mature tissue; it is concluded that seeds and other factors mentioned bear a relation to the development of stippen, probably because they play a part in the phenomenon of incipient wilting and also because they help to determine the distribution of water and nutrients.

The following paper is ready for publication:

- H. A. Phillips—Effect of climatic conditions on fruit trees in relation to the blooming and the ripening dates and the length of the growing period.

The following work is under way:

- D. B. Carrick—Factors involved in the cold storage of fruits.

Respiration of apples in relation to their keeping quality. A study of the respiratory quotient of apples at common-storage and cold-storage temperatures.

The influence of hydrogen-ion concentration on the injury of plant tissue exposed to low temperature.

The freezing point of various apple tissues.

The hardiness of scion and seedling roots of the apple.

- W. H. Chandler—The effect of pruning and of fruiting, especially seed production, on the amount of dry matter produced by a given leaf area, with apples, cherries, grapes, and gooseberries.

The recovery of fruit trees from serious winter injury.

Pruning peach trees.

- W. H. Chandler and A. J. Heinicke—The effect of pruning necessary to produce various forms, on the leaf surface, growth, and fruiting habit of apples, pears, plums, quinces, and cherries.

The relative response of gooseberries, currants, red and black raspberries, blackberries, young apple trees, and corn, when growing in the same soil, to applications of fertilizers.

- R. C. Dikeman—Germination of apple seeds, and the relation of vigor of seedlings to variation in size of apples.

- A. J. Heinicke—Factors that influence size and water supply of apples, and their relation to the occurrence of stippen.

The effect on fruit trees of possible secretions from grass roots.

The effect of different styles of pruning on the percentage of apple blossoms that set fruit.

Factors that influence the abscission of flowers or young fruits.

The effect of grass on the nitrogen supply of fruit trees, and response of the trees to variations in the nitrogen supply. (In cooperation with the Department of Soil Technology.)

- L. H. MacDaniels—Working out the anatomy and histology of the apple, *Pyrus malus*, with the idea of bringing together a complete account of this one plant which can be used as a reference in considering the structure of this and allied species.

A study of the graft union, from the standpoint both of the histological structure of "incompatible" species and of the alleged difficulty of top-working the Kieffer pear to other varieties of pear.

Further work on the histology of the phloem in certain woody angiosperms.

- E. L. Proebsting—A comparison of the growth of piece root graft from root systems, from weak and from vigorous apple trees.

Poultry Husbandry

In the Department of Poultry Husbandry the following work is under way:

- L. E. Card—A study of the influence of season of hatching on egg production in White Leghorns.
- F. M. Fronda—Temperature studies on poultry.
- G. F. Heuser—Effect of artificial illumination on growth and maturity.
Feeding hens for breeding purposes.
Methods of feeding pullets for egg production.
Methods of feeding pullets for egg production under artificial illumination.
Sources of animal protein.
Studies on digestion of feeds.
- O. B. Kent—Effect of accumulative selection on external characters.
Effect of inbreeding.
Inheritance of egg production in heavy breeds.
Inheritance of egg production in Leghorns.
Relation of external characters to egg production.
- W. G. Krum and F. L. Fairbanks—The amount of light required and the method of distribution in the artificial lighting of henhouses.
- H. I. Macomber and Esther Cornwall—The testing of various methods of preserving eggs, various egg preservatives, and the keeping qualities of different grades of eggs.
- Marion G. Pully—The testing of various methods of egg packages, through uniform shipments and laboratory tests, to ascertain the methods of packing that will cause the least breakage at a minimum cost.
- J. E. Rice and G. F. Heuser—Effect of artificial illumination on breeders.
Electric light and egg production. Influence of artificial illumination on egg production.
Flock segregation.

Rural Education

In the Department of Rural Education the following work is under way:

- O. G. Brim—The effect of local community differences on the rural elementary curriculum.
Relation of the New York State course of study to the rural school situation.
- J. E. Butterworth—Problems concerning rural school buildings: (1) A score card for one-teacher buildings. (2) A score card for combined elementary and

- secondary school buildings. (3) The status of rural school buildings in New York. (4) A program of improvement for rural school buildings in New York.
- E. N. Ferriss—The availability of secondary education for rural communities.
The distribution of the high school principal's time in the small high school.
The adaptability of the junior high school to rural conditions.
- T. H. Eaton and F. W. Lathrop—To discover types of farming and farm enterprises in the Schoharie region, as a guide to content selection in a high school course in agriculture.
- P. J. Kruse—The relation of speed and accuracy in mental functions.
The relation of achievements in New York State Regents examinations, and achievements in high school and college.
- R. M. Stewart—Inequalities of school support burdens.

Rural Engineering

In the Department of Rural Engineering the following work is under way:

- F. L. Fairbanks—A study of the thermal efficiency and the mechanical reliability of the Hvid engine.
- F. L. Fairbanks and W. G. Krum—A study of the methods of poultry-house lighting.
- F. L. Fairbanks and H. W. Riley—Development of a traction dynamometer for the testing of heavy draft implements, and the perfection of integrating devices for studying the records.
- J. C. McCurdy—In subsurface absorption tile receiving the effluent from small domestic septic tanks, a study of the effectiveness of various dosing methods.
In small domestic septic tanks, a study of the relation of tank design to the accumulation of sludge and scum and the discharge of suspended solids in the effluent.

Rural Social Organization

In the Department of Rural Social Organization the following work is under way:

- E. L. Kirkpatrick—The farmer's standard of living. To determine, by a survey of three or four hundred typical farm homes in Livingston County, the general standard of living of farmers as related to their income.
- D. Sanderson—A study of the rural neighborhoods of Otsego County, to determine the number and location of rural neighborhoods in that county and their social significance.
- D. Sanderson, W. S. Thompson, and P. Dunn—Survey of the rural churches in Tompkins County, New York.
- D. Sanderson and W. S. Thompson—A study of rural social organization. To discover the existing status in New York of rural community organization, particularly with regard to the behavior of rural communities and the natural process of social organization which has gone on in some of the more progressive rural communities of the State, with a view to making inductions as to the forces and processes of rural community organization.
- W. S. Thompson—A study of the social activities of the rural schools in Tompkins County, to determine their influence in the social life of their neighborhoods.
A study of the health problems of rural communities of Cortland County.

Soil Technology

In the Department of Soil Technology the following papers have been published :

- T. L. Lyon—The effect of liming on the composition of the drainage water of soils. *Amer. Soc. Agron. Journ.* **18**:124-130. 1921.

This is a contribution to the symposium on liming soils held at the Springfield meeting of the American Society of Agronomy. The literature bearing on the subject is reviewed, and experiments with lysimeters at this station are briefly reported.

- B. D. Wilson—Nitrogen in the rain water at Ithaca, New York. *Soil sci.* **11**: 101-110. 1921.

With an average yearly rainfall of 29.3 inches between May 1, 1915, and May 1, 1920, the soil received annually 12.51 pounds of nitrogen to the acre. Of this amount, 11.5 pounds was in the form of ammoniacal nitrogen and 1.01 pounds in the form of nitrate nitrogen. The amount of nitrogen in the rain water was to a large extent dependent on the amount of rainfall, a high nitrogen content accompanying a correspondingly high precipitation. The rainfall of the spring and summer months contained more nitrogen than did that of the other two seasons of the year. The quantity of ammoniacal nitrogen brought down in the rain falling at Ithaca is somewhat larger than that reported to be present in many parts of the world, while the nitrate nitrogen is about the same.

- J. K. Wilson—Device for growing large plants in sterile media. *Phytopathology* **10**: 425-429. 1920.

This is a detailed description of a device for growing plants in a sterile medium. Data are presented to show what results may be expected from experiments of 108 days duration with maize and oats. A reference is given to previous work on calcium hypochlorite as a seed sterilizer, and this was used also in securing sterile seeds for this work.

The following papers are ready for publication :

- A. F. Gustafson—The effect of drying soils on the water-soluble constituents.
 T. L. Lyon and J. A. Bizzell—Lysimeter experiments—II. Records for tanks 13 to 16 during the years 1913 to 1917 inclusive.
 T. L. Lyon and J. K. Wilson—Liberation of organic matter by roots of growing plants.
 A. McTaggart—The influence of certain inorganic salts applied to soil on the yield and nitrogen content of some legumes.
 T. L. Martin—Decomposition of green manures at different stages of growth.
 B. D. Wilson—Sulfur in the rain-water at Ithaca, New York.
 J. K. Wilson and B. D. Wilson—Influence of plant growth in solutions on reduction of nitrates, and formation of ammonia by pure culture of certain bacteria.

The following work is under way :

- J. A. Bizzell—To ascertain whether the composition of a soil type as now classified, is fairly uniform and characteristic.
 F. A. Carlson—Some of the relations of organic carbon in soils.
 F. B. Howe—Glacial water levels in Tompkins and Cayuga Counties.
 T. L. Lyon—To ascertain whether the soil type as now distinguished, is an index to the fertilizer needs of a soil.
 T. L. Lyon, J. A. Bizzell, and B. D. Wilson—To measure the nitrogen balance in soil under alfalfa and timothy grown continuously, and under certain crop rotations.

Formation of nitrates in soil during
and after the growth of timothy, clover, corn, and oats, as determined by
analysis of the leachings.

- T. L. Lyon, J. A. Bizzell, B. D. Wilson, and E. W. Leland—Composition of the drainage water from soils, with special reference to the effects of liming, fertilizing, and cropping.

- T. L. Lyon and H. O. Buckman—The effect of farm manure on the availability of raw rock phosphate.
- T. L. Lyon, A. J. Heinicke, and B. D. Wilson—The effect of sod on the disappearance of nitrates from soil when the trees are injured by sod.
- T. L. Lyon and B. D. Wilson—The effect of different cover crops or green manures when plowed under, on the formation of nitrates in soils.
- J. S. McHargue—Is manganese essential to the normal growth of higher plants?
- Auguste Pepin—Relation of soil basicity to the growth of alfalfa.
- B. D. Wilson—The quantities, forms, and sources of nitrogen and sulfur contained in the rainfall at Ithaca.
- J. K. Wilson—Growth of bacteria in sterilized soil, both planted and unplanted, when inoculated with pure cultures of certain bacteria capable of producing transformations of nitrogen.
- N. E. Winters—Influence of calcium carbonate in soil on the various forms of nitrogen.
- E. L. Worthen and A. F. Gustafson—Tests of certain methods of soil management applied to Ontario loam and Volusia silt loam at Churchville, Alfred, and Virgil.
- Departmental studies—Tests of various mixtures of fertilizer salts on different courses in a crop rotation, as a means of ascertaining soil productivity.
- The effect on soil productivity of continuous cropping when the organic matter of the soil is maintained by means of seeded crops.
- Comparison of the relative efficiency as soil amendments of burnt lime, limestone, marl, gypsum, dolomite, and magnesite, and of limestone ground to different degrees of fineness.

THE FINANCES

A complete detailed account of receipts and expenditures on all funds of the College is given in the annual report of the Comptroller of Cornell University, separately printed. Copies of this report may be had on application. A summary statement of finances is given here.

NEW YORK STATE DEPARTMENT OF AGRICULTURE
Financial Statement, 1920-21

Fund	Original appropriations	Expenditures previously reported	Amount available or unexpended July 1, 1920	Receipts, Income and Smith-Hughes, 1920-21	Expenditures 1920-21	Balance	
						Lapsed	Unexpended June 30, 1921
State							
1919-20 Maintenance	\$ 939,075.00	\$868,300.61	\$ 70,774.39	.....	\$ 56,202.25	\$14,572.14	.....
1919-20 Game Farm	12,715.00	11,806.88	908.12	.....	705.50	202.62	.....
1919-20 Deficiency	14,000.00	13,742.43	257.57	.....	257.57	.....	.....
1920-21 Maintenance	1,221,930.00	.....	1,221,930.00	.....	1,173,575.01	.....	\$48,354.99
1920-21 Game Farm	14,530.00	.....	14,530.00	.....	12,961.27	.....	1,568.73
1920-21 Deficiency	83,800.00	.....	83,800.00	.....	74,328.74	.....	9,471.26
1920-21 Indian Extension	10,000.00	.....	10,000.00	.....	5,856.12	.....	4,143.88
Total	\$2,296,050.00	\$893,849.92	\$1,402,200.08	.....	\$1,323,886.46	\$14,774.76	\$53,538.86
Federal							
Morrill and Nelson	\$ 20,000.00	.....	\$ 20,000.00	.....	\$ 20,000.00	.....	.....
Hatch and Adams	27,000.00	.....	27,000.00	.....	27,000.00	.....	.....
Smith-Lever	189,727.52	.....	189,727.52	.....	188,075.12	\$1,652.40	.....
Smith-Hughes	.....	.....	*(4,665.36)	\$25,555.43	27,036.24	.....	*(56,146.17)
Total	\$236,727.52	.....	\$232,062.16	\$25,555.43	\$262,111.36	\$1,652.40	*(56,146.17)
Income							
Tuition and fees	.....	.....	\$51,615.33	\$114,715.26	\$112,966.96	.....	\$53,363.63
Sales and services	.....	.....	14,416.06	272,281.35	254,346.66	.....	32,350.75
Total	.....	.....	\$66,031.39	\$386,996.61	\$367,313.62	.....	\$85,714.38
Grand total	.....	.....	\$1,700,293.63	\$412,552.04	\$1,953,311.44	\$16,427.16	\$143,107.07

* Overdraft on Smith-Hughes Fund covered by subsequent remittance from State Department of Education.

NEEDS AND RECOMMENDATIONS

1. The most imperative need of the College is that the building development, for which the College has now waited nearly twelve years since the requests were first filed with the Legislature, shall be put forward to completion without interruption. The College is most inadequately housed for the work which is required of it and which it is capable of doing. The service of the existing staff is seriously limited by the lack of proper working conditions.

2. There is most urgent need that larger funds be provided for printing the bulletins needed in the extension service and embodying the results of research carried on by the College.

3. It is recommended that the State reconsider its action withdrawing support for the Experimental Game Farm. The conservation of the wild life of the State should be placed on a scientific basis.

4. While the staff of the College is in the main provided, there is vital need that certain additional members be authorized by the Legislature. Demands are made on the College, in both teaching and extension, which it is impossible to meet with the present staff, and there is urgent need for assistance in a number of lines of investigation. Additional funds are needed from federal or state sources for the completion of the extension system, particularly for additional county home demonstration agents, county junior extension leaders, and extension specialists in distribution and marketing, in dairying, in animal husbandry, in rural social organization, and in home economics.

5. The funds for equipment and supplies have never been sufficient for the needs of the work. Much worn-out and out-of-date equipment, wholly unsuited for teaching the advances made in agriculture, has still to be used; and much of the work of the staff is lowered in efficiency by the necessity of using improper facilities, and by actual inability to purchase apparatus and materials needed for class and laboratory work.

6. The College should be enabled to make a more practical use of the soil survey, on which it has been long engaged. To do so requires (1) that analyses be made of the soil types from different regions in the State to ascertain whether the composition of a given type is fairly constant, wherever found, and that an inventory be made of the potential fertility of the soils of the State; (2) that tests be made of the fertilizer needs of soil types from different regions to determine whether there are characteristic requirements for each type; (3) that tests of systems of soil management be made on a few important soil types by means of out-lying experiment fields located on those types. Such studies are fundamental to the permanent maintenance of our most important asset, the

fertility of the soil. The College has the scientific staff for conducting this work, but needs technical assistance, field labor, materials, and funds for the acquisition and operation of the necessary outlying fields. Additional operating funds would extend the accomplishments of the present scientific staff.

7. The Summer School in the College of Agriculture has grown steadily and rapidly. It is designed chiefly to aid teachers, supervisors, and others engaged in the field of rural education. The present small state appropriation is not sufficient to meet the growth in the school and also to pay proper salaries. The salary scale for the Summer School in Agriculture is considerably below that paid in the general university Summer Session, and is also less than that paid by other institutions for similar work. It is therefore becoming increasingly difficult to obtain the services of the necessary teachers to maintain the courses. The appropriation for this work should be largely increased.

In submitting this report, I desire to acknowledge the substantial aid in its preparation given by Dr. W. H. Chandler, Vice Director of Research, Professor D. J. Crosby, Acting Vice Director of Extension, and Dr. Cornelius Betten, Vice Dean of Resident Teaching, as well as of heads of departments and other members of the faculty.

Respectfully submitted,

A. R. MANN,

Dean and Director.

INDEX

A	PAGE
Acting President's letter of transmittal	9
Agricultural Chemistry, extension work in	58
Agricultural Chemistry, research in	76
Agricultural Chemistry, transfer to College of Arts and Sciences	20
Agricultural Economics and Farm Management, extension work in	58
Agricultural Economics and Farm Management, research in	76
Agricultural journalism, courses in	52
Agronomy, new name of department	21
Allen, A. A.	61
Animal Husbandry, extension work in	59
Animal Husbandry, research in	77
Appointments to staff	19
Ayres, W. E.	60
B	
Babcock, H. E.	19
Bailey, L. H.	19
Bankers' Association, New York State, scholarships	18
Barrus, M. F.	70
Bee keeping, extension work in	60
Behrends, F. G.	74
Bennett, W. H.	19
Biological field station, land for	25
Biology, work in	34
Botanical collections, additions to	26
Botany, consolidation of instruction in	20
Botany, extension work in	59
Botany, research in	78
Bradley, J. C.	26
Brew, J. D.	60
Brewster, H. C.	19
Brim, O. G.	19
Brockway, A. L.	24
Bruch, Carlos	27
Building program	22
Burnham, Stewart	26
Butler, M. D.	19
C	
Carrick, D. B.	19
Changes in internal organization	20
Changes in staff	19
Chemistry, Agricultural, transfer to College of Arts and Sciences	20
Chupp, C.	70
Collingwood, G. H.	63

INDEX

	PAGE
Commercial cooperative organizations, policy of College with respect to	38
Comstock, J. H.	76
Conservation of forests and wild life, program of	30, 34
Correspondence courses	51
County fair exhibits	49
Curtis, R. W.	67

D

Dairy Industry, extension work in	60
Dairy Industry, research in	80
Dean's report	15

E

Eaton, T. H.	19
Enrollment of students	15
Entomological collections, additions to	26
Entomology, extension work in	60
Entomology, research in	81
Experimental game farm	27
Extension activities of College	45
Extension schools	47
Extension staff	3
Extension workers, summary of field activities	57
Extension work with Indians	49

F

Fair exhibits	48, 49
Farm bureaus	55
Farm Crops, discontinuance of department	21
Farm Crops, extension work in	61
Farm Crops, research in	84
Farmers' Field Days	48
Farmers' organizations, policy of College with respect to	38
Farmers' Week	47
Farm study courses	51
Faz, Alfredo	27
Fellowships, industrial	43
Felt, E. P.	60
Field meetings	45
Financial statement	95
Fippin, E. O.	19
Fish culture	35
Fisk, W. W.	60
Flansburgh, E. A.	19
Floriculture, research in	85
Forbes, W. T. M.	27
Forestry, extension work in	63
Forestry, research in	85
Forestry, work in	31

INDEX

G

	PAGE
Gallion, E. J.	18
Game farm, experimental	27, 35
Geneva station, relations of College with	37
Geographic distribution of students	16
Graves, Lulu	19
Guise, C. H.	63
Gustafson, A. F.	75

H

Heating plans for College	9
Heinicke, A. J.	19
Hillegas, M. B.	72
Home bureau work	66
Home Economics, extension work in	64
Home Economics, School of	39
Hopper, H. A.	59

I

Indians, extension work with	49
Industrial fellowships	43
Instructing staff	3

J

Jenks, J. W.	26
Jordan, W. H.	20
Journalism, agricultural, courses in	52

K

Kirby, R. S.	69, 70
-------------------	--------

L

Ladd, C. E.	19, 58
Landscape Art, change in organization	20
Landscape Art, extension work in	67
Landscape Art, research in	86
Leister, C. R.	61
Livermore, K. C.	19
Lumsden, David	19
Lyon, T. L.	21

M

Mann, A. R., report	15
Meteorology, extension work in	68
Meteorology, research in	86
Montgomery, E. G.	19

N

Nehrling, A. H.	19
Newman, J. T.	26
New York State Bankers' Association scholarships	18

INDEX

P

	PAGE
Parrott, P. J.	60
Peck, G. W.	19, 70
Pierson, L. E.	19
Pilcher, L. F.	14, 23, 24
Plant Breeding, extension work in	68
Plant Breeding, research in	86
Plant Pathology, extension work in	68
Plant Pathology, research in	87
Pomology, extension work in	70
Pomology, research in	89
Porter, J. P.	67
Poultry Husbandry, extension work in	71
Poultry Husbandry, research in	91
President's letter of transmittal. <i>See</i> Acting President's letter of transmittal.	
Publications, distribution of	53
Publications, list of	53
Publications, report on	51
Publications, summary of	55

R

Recommendations	96
Reed, Carlos	27
Rees, R. W.	19, 70
Registration of students	15
Research activities of College	75
Rice, F. E.	58
Robertson, F. E.	19
Royce, C. H.	59
Rural Education, extension work in	72
Rural Education, research in	91
Rural Engineering, extension work in	73
Rural Engineering, research in	92
Rural Social Organization, extension work in	74
Rural Social Organization, research in	92

S

Sanderson, Dwight	75
Scholarships, New York State Bankers' Association	18
Scholes, Bonnie E.	19
School of Home Economics	39
Small, J. K.	26
Smith, A. W., letter of transmittal	14
Soil Technology, extension work in	75
Soil Technology, renaming of department	21
Soil Technology, research in	93
Staff appointments and changes	19
Staff of instruction and extension	3

INDEX

	PAGE
State Fair exhibits	48
Student registration	15
Surveys of country weeklies	52

T

Teaching staff. <i>See</i> Instructing staff.	
Thatcher, R. W.	20
Thomas, H. E.	19, 70
Thompson, H. C.	21
Treman, R. H.	19
Turner, S. G. H.	18

V

Vegetable Gardening, extension work in	62
Vegetable Gardening, reestablishment of department	21
Veterinary College, association with	21
Vinson, C. G.	70

W

Whitney, C. W.	74
Works, G. A.	72
Worthen, E. L.	75

New York Agricultural Experiment Station.

GENEVA, N. Y.

FORTIETH ANNUAL REPORT

WITH THE DIRECTOR'S REPORT FOR 1921

R. W. THATCHER



PUBLISHED BY THE STATION

BOARD OF CONTROL

GOVERNOR NATHAN L. MILLER, Albany.
 COMMISSIONER BERNIE A. PYRKE, Albany.
 IRVING ROUSE, Rochester.
 FRANK M. BRADLEY, Barker.
 CHARLES C. SACKETT, Canandaigua.

CHARLES R. MELLEN, Geneva.
 JOHN B. MULFORD, Lodi.
 C. FRED BOSHAERT, Lowville.
 PETER G. TEN EYCK, Albany.

OFFICERS OF THE BOARD

CHARLES R. MELLEN,
President.

WILLIAM O'HANLON,
Secretary and Treasurer.

STATION STAFF

ROSCOE W. THATCHER, D. Agr., *Director.*

†ALBERT R. MANN, A.M., <i>Agricultural Economist.</i>	MILLARD G. MOORE, B.S., NATHAN F. TRUE, A.B., LEON R. STREETER, B.S., <i>Assistant Chemists.</i>
GEORGE W. CHURCHILL, <i>Agriculturist.</i>	ARTHUR C. DAHLBERG, M.S., <i>Associate in Research (Dairying).</i>
REGINALD C. COLLISON, M.S., <i>Chief in Research (Agronomy).</i>	JAMES D. LUCKETT, M.S.A., <i>Editor and Librarian.</i>
†T. LYTLETON LYON, Ph.D., <i>Chemist (Agronomy).</i>	LAURA G. COLLISON, A.B., <i>Assistant Editor and Librarian.</i>
JAMES E. MENSCHING, M.S., <i>Associate in Research (Agronomy).</i>	PERCIVAL J. PARROTT, M.A., <i>Chief in Research (Entomology).</i>
JAMES D. HARLAN, B.S., <i>Assistant in Research (Agronomy).</i>	†GLENN W. HERRICK, B.S.A., <i>Entomologist.</i>
WILLIAM P. WHEELER, <i>Associate in Research (Animal Industry).</i>	HUGH GLASGOW, Ph.D., FRED Z. HARTZELL, M.A. (Fredonia), <i>Associates in Research (Entomology).</i>
ROBERT S. BREED, Ph.D., <i>Chief in Research (Bacteriology).</i>	CLARENCE R. PHIPPS, B.S., GUY F. MACLEOD, B.S., <i>Assistants in Research (Entomology).</i>
HAROLD J. CONN, Ph.D., <i>Chief in Research (Soil Bacteriology).</i>	ULYSSES P. HEDRICK, Sc.D., <i>Vice-Director; Chief in Research (Horticulture).</i>
†WILLIAM A. STOCKING, Jr., M.S.A., <i>Bacteriologist.</i>	†ROLLINS A. EMERSON, Sc.D., <i>Geneticist.</i>
GEORGE J. HUCKER, M.A., <i>Associate in Research (Bacteriology).</i>	†WILLIAM H. CHANDLER, Ph.D., <i>Pomologist.</i>
ARCHIE H. ROBERTSON, B.S., <i>Assistant in Research (Bacteriology).</i>	FRED E. GLADWIN, B.S. (Fredonia), ORRIN M. TAYLOR, GEORGE H. HOWE, B.S.A., RICHARD WELLINGTON, M.S., <i>Associates in Research (Horticulture).</i>
FRED C. STEWART, M.S., <i>Chief in Research (Botany).</i>	THOMAS O. SPRAGUE, B.S., HAROLD B. TUKET, M.S., FRED R. CLARK, M.S., <i>Assistants in Research (Horticulture).</i>
†DONALD REDDICK, Ph.D., <i>Botanist.</i>	JAMES S. LAWSON, Phil.B., <i>Museum Preparator.</i>
WALTER O. GLOYER, M.A., <i>Associate in Research (Botany).</i>	JESSIE A. SPERRY, <i>Director's Secretary.</i>
MANCEL T. MUNN, M.S., <i>Associate Botanist.</i>	FRANK E. NEWTON, WILLARD F. PATCHIN, LENA G. CURTIS, MAE M. MELVIN, MAUDE L. HOGAN, K. LORAIN HORTON, <i>Clerks and Stenographers.</i>
ELIZABETH F. HOPKINS, A.B., <i>Assistant Botanist.</i>	ELIZABETH JONES, <i>Computer and Mailing Clerk.</i>
LUCIUS L. VAN SLYKE, Ph.D., <i>Chief in Research (Chemistry).</i>	
RICHARD F. KEELER, M.S., <i>Associate in Research (Chemistry).</i>	
RUDOLPH J. ANDERSON, Ph.D., <i>Chief in Research (Biochemistry).</i>	
†LEONARD A. MAYNARD, Ph.D., <i>Biochemist.</i>	
WALTER L. KULP, M.S., <i>Assistant in Research (Biochemistry).</i>	
ARTHUR W. CLARK, B.S., <i>Associate Chemist.</i>	
MORGAN P. SWEENEY, A.M., WILLIAM F. WALSH, B.S., <i>Assistant Chemists.</i>	

Address all correspondence, not to individual members of the staff, but to the
 NEW YORK AGRICULTURAL EXPERIMENT STATION, GENEVA, N. Y.

The Bulletins published by the Station will be sent free to any farmer applying
 for them.

† Members of the faculty of the New York State College of Agriculture affiliated with this Station.

STATE OF NEW YORK:

DEPARTMENT OF FARMS AND MARKETS,

ALBANY, January 16, 1922.

To the Legislature of the State of New York:

As Commissioner of Farms and Markets, I have the honor to submit herewith the Fortieth Annual Report of the Director of the New York Agricultural Experiment Station, at Geneva, N. Y., in pursuance of the provisions of the Agricultural Law.

I am, respectfully yours,

BERNE A. PYRKE,
Commissioner of Farms and Markets.

NEW YORK AGRICULTURAL EXPERIMENT STATION.

R. W. THATCHER, *Director.*

GENEVA, N. Y., *December 15, 1921.*

HON. CHARLES R. MELLEN,
President of the Board of Control,
Geneva, N. Y.

Dear Sir: In compliance with Section 306 of Article 14 of the Agricultural Law of New York, I have the honor to transmit herewith the report of the Director of the New York Agricultural Experiment Station for the year 1921.

Yours respectfully,
R. W. THATCHER,
Director.

GENEVA, N. Y., *January 3, 1922.*

HON. BERNE A. PYRKE,
Commissioner of Farms and Markets,
Albany, N. Y.

Dear Sir: I have the honor to transmit herewith the Fortieth Annual Report of the Board of Control of the New York Agricultural Experiment Station, comprising the Treasurer's report for the fiscal year ended June 30, 1921, and the Director's report for the calendar year 1921.

Yours respectfully,
CHARLES R. MELLEN,
President of the Board of Control.

GENEVA, N. Y., *January 3, 1922.*

HIS EXCELLENCY, NATHAN L. MILLER,
Governor of New York,
Albany, N. Y.

Sir: In compliance with the requirement of the act of the United States Congress of 1887, known as the "Hatch Act," providing for the establishment of agricultural experiment stations in the several states, I have the honor to transmit herewith the Fortieth Annual Report of the New York Agricultural Experiment Station, for the year 1921.

Yours respectfully,
CHARLES R. MELLEN,
President of the Board of Control.

TABLE OF CONTENTS

	PAGE
Treasurer's report	7
Director's report for 1921	9
Administration	11
Station staff	11
Maintenance fund	12
Needed increases in financial support	13
Meetings of the Station staff	14
Progress of Station work during 1921	15
Division of Agronomy:	
Tobacco experiments	15
Fertilizer experiments with fruits	15
Sources of liming materials	16
Soil fertility experiments	16
Soils of the Chautauqua "grape belt"	16
Lysimeter investigations	17
Liming experiments	17
Nitrogen changes in manure	17
Division of Animal Industry:	
Feeding experiments with poultry	18
Breeding experiments with poultry	18
Study of soil requirements	18
Division of Bacteriology:	
General problems	18
Technic	18
Soil and manure problems	19
A general study of the soil flora	19
The decomposition and preservation of manure	20
The effect of one plant on another	21
Dairy problems	21
Market milk problems	21
Cheese problems	22
Food control problems	23
Tomato products investigations	23
Division of Biochemistry:	
Analysis and composition of corn pollen	24
Metabolism and respiratory exchange of poultry during vitamine starvation	24
Division of Botany:	
Potato experiments	25
Missing hills in potato fields and variation in yield from halves of same seed-tuber	25
Potato seed experiments	26
"Running out" of potatoes on Long Island	26
Control of leafroll and mosaic in the potato seed plat	26
Spread of potato leafroll to adjoining healthy plants	27
Dusting vs. spraying potatoes	27
Winter injury of apple trees	27
Blister canker of apple	27
Bean studies	27
Aster diseases	28
Seed testing and seed studies	28

	PAGE
Division of Chemistry:	
Properties of casein.....	29
Inspection of commercial fertilizers, 1921.....	29
Inspection of feeding stuffs, 1920.....	29
Division of Dairying:	
Testing glassware.....	30
Cooperation with other divisions.....	31
Division of Entomology:	
Control of pear thrips.....	31
Control of apple aphids with delayed dormant spray.....	31
Control of apple red bugs by dusting.....	32
Studies on peach insects.....	33
Studies on cabbage insects.....	33
Studies on pear insects.....	33
Studies on potato insects.....	34
Studies on grape insects.....	34
Studies on San Jose scale.....	34
Spider mites on fruit trees.....	34
Division of Horticulture:	
Tests of fruit varieties.....	34
Breeding experiments.....	35
Fertilizer experiments with fruits.....	35
Pruning experiments.....	35
Propagation experiments.....	36
A study of strains of Baldwin apple.....	36
Stock experiments.....	37
Asexual inheritance in the violet.....	37
Effect of one crop upon another.....	37
Germination of seed of hardy fruits.....	38
A study of sex in grapes.....	38
Publications issued during 1921.....	38

FORTIETH ANNUAL REPORT

OF THE

Board of Control of the New York Agricultural Experiment Station

TREASURER'S REPORT

GENEVA, N. Y., July 1, 1921.

To the Board of Control of the New York Agricultural Experiment Station:

As Treasurer of the Board of Control, I respectfully submit the following report for the fiscal year ended June 30, 1921.

RECEIPTS

1920

July 1. To balance on hand.....		\$5,040 74
Salaries and labor (Albany).....	\$149,313 21	
Repairs (Albany)	747 00	
Adams fund	1,465 22	
Hatch fund	1,499 49	
Maintenance and operation (first adv.)	6,149 95	
Fuel, light, and power.....	5,833 34	
Printing	284 89	
Equipment and supplies.....	13,333 34	
Hired horses and vehicles....	2,176 54	
Traveling expenses	2,500 00	
Communication	2,083 34	
General plant service.....	833 33	
Rent	492 01	
Repairs	2,082 27	
Produce	5,168 80	
	<hr/>	
	\$193,962 73	193,962 73
		<hr/>
		\$199,003 47
		<hr/>

EXPENDITURES

Salaries and labor (Albany).	\$149,313	21	
Repairs (Albany)	747	00	
Adams fund	1,499	76	
Hatch fund	1,492	16	
Fuel, light, and power.....	7,304	41	
Printing	284	89	
Equipment and supplies.....	15,216	20	
Hired horses and vehicles....	2,425	88	
Traveling expenses	2,982	43	
Communication	2,497	33	
General plant service.....	999	99	
Rent	650	00	
Repairs	1,495	27	
Produce, remitted to Treasurer State of New York.....	5,168	80	
	\$192,077	33	\$192,077 33
Balance on hand June 30, 1921.....			6,926 14
			<u>\$199,003 47</u>
Balance Ring Memorial Fund.....			<u>\$1,293 52</u>

All expenditures are supported by vouchers approved by the Auditing Committee of the Board of Control and have been forwarded to the Comptroller of the State of New York.

(Signed) W. O'HANLON,
Treasurer.

DIRECTOR'S REPORT FOR 1921

To the Honorable Board of Control of the New York Agricultural Experiment Station:

Gentlemen.— For the first time it becomes my pleasant duty to prepare a report of the year's operation of the experiment station which is under your charge. I assumed the duties of the directorship, on July 1 last, with a keen sense of the honor conferred upon me in being chosen to fill the position the duties of which had been so ably performed thru the preceding twenty-five years by former-Director Jordan, and with a profound feeling of responsibility for the continued maintenance of the high standards of research and careful investigation and the splendid reputation and standing which the New York Agricultural Experiment Station at Geneva enjoys, both at home and abroad. I have taken up these duties and responsibilities with a confident reliance in your wisdom and experience in guiding the affairs of the institution and with a keen appreciation of the helpful attitude of counsel and advice which you have already manifested toward me, and which I know to have been a constant source of strength and pleasure to Dr. Jordan.

It is both eminently fitting and a peculiar personal pleasure for me to present here a few extracts from a recent editorial in *Experiment Station Record*, published by the States Relations Service of the United States Department of Agriculture, commenting upon the occasion of Dr. Jordan's retirement:

Dr. W. H. Jordan, who retired in June, was one of the few remaining pioneers among the state directors who aided in founding and building the American system of agricultural research. He was the last of the group who bind the original State stations with the present national system. * * *

The period of his activity covers the greatest period of development in the American stations, not only in point of revenue but in the growth of agricultural research. He stood consistently through the formative period of the stations for the high ideals and purposes which these institutions were to express. His voice was heard in no uncertain terms in setting forth these ideals, in defining the nature and essentials of research, in criticism of tendencies he believed to be injurious, and in constructive suggestion.

From the first, Dr. Jordan had a clear vision of the field and function of the experiment station as an institution for acquiring information through experiment and research. He contended that the Hatch Act established it "as a means of experimentation and research, and for no other purpose;" that to maintain otherwise was to distort the understanding of an experiment station and the idea fundamental to its organization as expressed in the word "experiment;" and that a station functioning chiefly as an instrument of popular instruction was an absurdity. * * *

Since knowledge is a limiting factor in all human endeavor, and it is the primary function of the station to acquire that knowledge essential to agriculture, he made many an ardent plea for opportunity to do its work, and for protection of the station from demands which were outside its proper field. On more than one occasion he called attention to the distortion of the stations' function, the extent to which they have been "coerced in efforts that do not belong to them," and declared that "the greatest and most permanent acquisitions that have come to agriculture as an art during the past fifty years are the outcome of profound scientific study." Again, he explained that "agricultural practice has no greater need today than an enlarged vision through more and safer knowledge, and that a new truth may have vastly greater value than many volumes of pleasing addresses." It was an apt illustration of his in referring to the application of scientific facts that "it is easier to cut a diamond to its setting than it is to find it."

Dr. Jordan helped us to understand what science is and what it is not, what the essentials are of scientific inquiry, and the distinction between research worthy of the name and other types of work. While admitting that purely practical and local experiments had brought farmers into sympathy with science as a means of progress, he drew the conclusion that "we should guard against centering an experiment around facts or conditions which are of mere local or temporary importance;" and he added that the literature was "already cluttered with so-called practical conclusions that in a brief time will be swept into the rubbish corner." He held it as fundamental to the largest success that experiments should "deal with matters of general and permanent utility;" and he reminded his hearers that the "contributions of note which have entered into the warp and woof of agricultural practice are those which have been proclaimed from the inner temple of science," and furthermore that "the discoveries of scientific truth which are today blessing the farmer in his daily toil are mostly those which have been reached through the severest and most searching investigations." * * *

Perhaps it was in the field of criticism that some of Dr. Jordan's most useful work was done. He preserved the attitude of scientific criticism toward his own work and that of his associates, for he sought sound truth and abhorred superficiality or hasty conclusions where the evidence was defective. His clear analysis of problems and the requirements for their solution was most helpful.

His frank exposure of what he conceived to be weaknesses in the stations, his vigorous comments on conditions and practices which ought to give way to higher standards, were made in no spirit of censoriousness, but with a directness that expressed the force of his convictions. They came with a full understanding of the difficulties under which many of the institutions labored, but with no disposition to condone. He looked for progress, and he urged constant pressure in that direction, reminding his co-workers that in this most ambitious and extensive scientific effort of the day their ideals, intelligence, integrity of thought and ability, in things scientific, would be judged by the outcome of their labors. * * *

The influence of such a vigorous, clear-visioned character in the councils of the experiment stations for a period of thirty-six years can hardly be overestimated. It is apparent only after a review of the things he contended for and the course which development has taken. He has been a leader in the march of progress. He will be greatly missed in the meetings of the Association and in his personal relations with those engaged in agricultural research. All who have known him will join in the feeling expressed in the resolutions of the faculty of the Cornell College of Agriculture, that "he has richly earned the relief which retirement from active service brings," and will "wish him many years in which to enjoy the privileges of the contemplative life."

The lack of health and physical strength prevented the realization of Dr. Jordan's hope, expressed in his last report to you, that he would, before relinquishing the directorship, be "able to prepare a resumé, in a somewhat popular form, of the results of Station work important to practical agriculture, which have been secured during the past twenty-five years." Such a resumé would be a fitting climax to the many contributions which he has made to the literature of American agriculture. I have earnestly urged him to undertake its preparation as soon as his strength will permit and it is greatly to be hoped that he may soon be able to undertake this important work. It is to be hoped also that when the resumé is ready for printing, this Station may have the honor of publishing it.

ADMINISTRATION

STATION STAFF

Reference has been made above to the retirement of Dr. Whitman H. Jordan on June 30, 1921, after 25 years of service as Director of this Station. On July 1, I took up the duties of this position to which you had chosen me at your meeting on March 14, 1921. In accordance with the custom with new appointments to the staff, I present the following brief summary of my academic training and professional experience. I was graduated from the University of Nebraska with the degree of B.Sc. in 1898, and received from the same institution the M.A. degree (1901), and the honorary degree of D.Agr. (1920). After teaching science in the Beatrice, Nebraska, High School for one year (1898-99), I was for two years assistant chemist of the Nebraska Agricultural Experiment Station. In June, 1901, I removed to the State College of Washington, at Pullman, Washington, where I held successively the following positions: Assistant chemist (1901-03), chemist (1903-10), and director (1907-13) of the Experiment Station; assistant professor (1905-07), associate professor (1907-10), and professor of agricultural chemistry (1910-13); superintendent of farmers' institutes (1907-10); and head of the Department of Agriculture (1910-13). On May 31, 1913, I removed to the University of Minnesota, where I filled the following positions: Professor of plant chemistry and plant chemist of the Experiment Station (1913-17); assistant director of the Experiment Station (1916-17); and dean of the Department of Agriculture and director of the Agricultural Experiment Station (1917-21).

George A. Smith retired October 30, 1921, after more than thirty-five years of service to agriculture in New York, the last twenty-four years of which were as dairy expert at this Station. His wealth of experience and wide familiarity with the dairymen

and dairy conditions in this State gave him a particular advantage in meeting the practical problems of the dairy industry which no one can possibly be found qualified to furnish. The dairy research of this Station in the future must, therefore, be organized and carried on in a somewhat different way than it has been during Mr. Smith's long period of service.

Theodore E. Gaty, B.S., Assistant in Research (Horticulture) resigned March 31, 1921, to accept a position as a farm manager in Columbia county.

Clarence R. Phipps B.S., resigned his position as Assistant in Research (Entomology) on December 31, 1921, in order to become Entomologist of the Missouri Fruit Station.

T. O. Sprague, B.S., resigned as Assistant in Research (Horticulture) on December 31, 1921, on account of ill-health.

Appointments during the year were as follows:

Leon R. Streeter, B.S., a graduate of Colgate University, was appointed Assistant Chemist, beginning February 1, 1921.

Archie H. Robertson, B.S., graduate of Cornell University, began work on February 1, 1921, as Assistant in Research (Bacteriology).

Fred R. Clark, M.S., a graduate and post-graduate student of the University of Michigan, was appointed Assistant in Research (Horticulture) November 1, 1921.

Arthur C. Dahlberg, M.S., a graduate from the course in dairy husbandry of the University of Minnesota with graduate work in the chemistry and bacteriology of milk and its products at the same institution, and with four years of subsequent experience in dairy teaching and extension work, followed by two years as manager of a large cooperative creamery at Fargo, North Dakota, was appointed as Associate in Research (Dairying), beginning November, 1921.

M. P. Sweeney, who had been on leave of absence for graduate study, returned to duty on June 27, 1921. James D. Harlan and Walter L. Kulp were given leaves of absence, beginning October 1, for graduate study at the State Agricultural College at Cornell University and at Yale University, respectively.

MAINTENANCE FUND

The expenditures of the Station during the fiscal year ended June 30, 1921, were as follows:

Personal service	\$148,071 46
Maintenance and operation	52,647 97
Total	\$200,719 43

The Legislature of 1921 made the following appropriations for the use of the Station during the fiscal year beginning July 1, 1921:

Personal Service:		
Salaries and wages	\$146,250 00	
Salary of geneticist (special)	2,750 00	
		\$149,000 00
Maintenance and operation:		
(Undistributed)		49,400 00
Insecticide and fungicide investigations.....		5,000 00
Total		<u>\$203,400 00</u>

The budget proposal for 1922-23 carries the following sums for the various needs of the institution:

Personal Service		\$172,240 00
Maintenance and operation:		
Fuel, light, power, and water.....	\$7,500 00	
Printing and advertising	13,500 00	
Equipment, supplies, and materials.....	23,500 00	
Traveling expenses	3,500 00	
Communication	2,500 00	
Fixed charges and contributions.....	100 00	
Rent	575 00	
Repairs and alterations	6,000 00	
		* 57,175 00
Construction or permanent betterments.....		88,500 00
Total		<u>\$317,915 00</u>

NEEDED INCREASES IN FINANCIAL SUPPORT

The appropriations made by the Legislature of 1921 made available for the support of this Station for the fiscal year beginning July 1, 1921, a sum which is \$4,400 less than the total granted for the same purposes during the preceding year. This was in spite of the facts which were pointed out in last year's report that the salaries of the members of our staff are not yet on a par with those paid to men of similar ability in similar lines of work in the State, and that there is imperative need for a new range of forcing houses and a new cold storage plant in order to maintain adequately our present work. The need for economy in state and national expenditures is apparent to everyone. It is poor policy, however, for the State to curtail its expenditures for those enterprises which increase agricultural production and add to the taxable wealth of the State.

With this in mind, the budget proposals for the coming year have been made up on the basis of providing adequately for the

* If appropriated in a lump sum, \$54,000.

needs of the Station on its present basis of operation. Moderate increases over existing allotments are asked for the purpose of bringing our salary scale to a par with that of the other State-supported agricultural agencies. Modest increases in the allotments for labor and for equipment are asked in order to permit the repairs to our fences, buildings, and equipment which have been suspended since the outbreak of the war and which must now be made if the State's property here is not to be allowed to deteriorate beyond the possibility of repair, thus requiring much more expense thru new construction in order to restore the property to workable condition. The request for the forcing houses and cold storage plant has been renewed as a need which is growing more and more urgent as the provision for them is longer delayed. To these has been added a request for small items to provide a coal shed to make possible needed economies in handling our fuel and an additional silo for preserving our feed crops in better form for economical use as well as to provide facilities for experimental work with new silage crops. These items have all been carefully scrutinized to see that they are reduced to the lowest possible minimum for efficient operation of our plant, with the result that the total requested is approximately \$10,000 less than was asked for the same purposes last year.

Following out the suggestion made by Director Jordan last year, we have been at work upon a definite program for the future development of the Station. This program should include both an outline of the general policies which are to be followed in the development of the work of the Station and a plan for the future equipment of buildings, etc., which will be necessary to carry out the program. Significant progress has been made in the preparation of this program and it is hoped that a tentative plan of it may be ready for presentation to you for consideration in the near future.

MEETINGS OF THE STATION STAFF

Beginning with October, there have been held regular monthly meetings of the working staff of the Station, for the consideration of general problems concerning the organization and administration of Station work and the promotion of conditions favorable to the highest type of research in the agricultural sciences. Standing committees on Staff Business and on The Station Library have been appointed and are actively at work, promoting facilities in the fields represented by their titles. A special committee has made a study and presented a report concerning possible methods of promoting the research spirit, which report will probably lead to some definitely organized plan for fostering the research spirit and providing additional experience and training in research methods for all of the members of the staff.

PROGRESS OF STATION WORK DURING 1921

A marked departure from the plan of former years has been made in the preparation of the following report of the progress of our Station work during the past year. Formerly, this report consisted only of a review of the bulletins which had been issued during the period covered by the report. Obviously, such a review did not constitute a complete survey of the Station's activities during the year, since many investigations are in progress which do not come to the point of final publication in bulletin form during any given year. It seemed to me desirable that the Director's report for the year should give a fairly complete summary of the work of the Station which was in progress during that period. I have, therefore, asked the chiefs in research to prepare brief statements indicating the progress which has been made during the year on all of the projects which have been under way under their supervision. The following statements, therefore, present a fairly complete, altho necessarily very brief and concise, summary of the Station work during the year 1921.

DIVISION OF AGRONOMY

TOBACCO EXPERIMENTS

Two field plat experiments have been conducted for the past seven years in cooperation with the Bureau of Plant Industry of the United States Department of Agriculture. This work is located in the Baldwinsville section. One of the experiments was originally planned to determine if alfalfa could be grown in this region. Tobacco was included in the rotation because the majority of farmers in this section raise a small acreage of this crop every year.

The other experiment is concerned chiefly with the effects of fertilizers, without farm manure, on the quality of tobacco. It has been demonstrated that alfalfa can be successfully grown in this section where the proper methods are followed.

Fertilizers have had a considerable effect on the quality of cigar filler tobacco grown in this locality. Altho yields of tobacco have not been as large as where liberal applications of farm manure have been used, nevertheless under the best plat treatment both yield and quality have compared rather favorably in spite of the fact that tobacco occupies the land once in four years in the experiment instead of once in five years as is common in this section.

FERTILIZER EXPERIMENTS WITH FRUITS

This work is a continuation of that reported in Bulletin No. 477, June, 1920. The same orchards, namely, two Baldwin apple

orchards, one Spy apple orchard, one cherry orchard, one Kieffer pear orchard, and also one vineyard in Chautauqua county, are still under experiment.

The work this year has in no way conflicted with the conclusions drawn in the above-mentioned bulletin.

SOURCES OF LIMING MATERIALS

For some years past it has been the endeavor to keep in touch with all sources of agricultural liming materials in the State. Bulletin No. 478 gives the most recent list of these sources together with data for calculating the actual cost of material laid down on the farm. It is questionable whether this practice will be continued by the Station since the soils division of the Extension Service of the Cornell Agricultural College is looking after the matter of lime supplies for the farmers of New York.

SOIL FERTILITY EXPERIMENTS

In 1914 and 1915 a series of 104 one-tenth acre plats was laid out on the Station farm at Geneva and placed under systematic fertilizer treatment.

Up to date the work has demonstrated some of the many errors to which field plat work is subject. A critical study of the yields for the past seven years has shown that variations in soil type, composition, and topography among these plats have greatly affected crop yields. In fact, these factors seem to have been more important in affecting yields than have the fertilizer treatments.

If the field plat method is to retain the importance it has had in the past as a method of soil study, greater care will have to be given in laying out such work, so as to insure the greatest possible uniformity in plats and more adequate methods of control.

SOILS OF THE CHAUTAUQUA "GRAPE BELT"

During the years 1911 to 1916 this Station made extensive studies of the chemical composition of the soils of New York. Among the soils studied were 152 samples of soils from the so-called grape belt in Chautauqua county. As this group seemed to be a distinct unit in itself the analyses of these 152 samples has been published as Technical Bulletin No. 85.

The composition of these samples indicates that the majority of grape belt soils are well supplied with nitrogen, potassium, and magnesium, but are low in phosphorus and calcium and very deficient in carbonates.

For many crops, these soils would undoubtedly respond to additions of available phosphorus and to lime. Vineyard and cover crop experiments conducted by the Station on these soils

indicate that farm crop yields are much more likely to be affected by these soil deficiencies than are the yields of commercial vineyards on the same soils.

LYSIMETER INVESTIGATIONS

The Station now has the accumulated data of six to seven years on the twenty lysimeters installed in 1914-15. These lysimeters are furnishing a mass of valuable data on the question of the in-go and out-go of mineral constituents in connection with legume and non-legume crop rotation. The nitrogen problem has been emphasized. The first five years' results will soon be available. Analyses of the drainage water from these tanks have shown that during the first five years, a Volusia soil under a four-year rotation including two years of alfalfa has lost over seven times as much nitrate nitrogen as has the same soil under a rotation in which two years of timothy have replaced the alfalfa. In spite of this greater loss of nitrate from the soil under an alfalfa rotation, this soil has given in the barley crop succeeding alfalfa an increase of 4,370 pounds per acre over barley after timothy. This increase is also reflected in the wheat crop the following year.

Further data are also at hand bearing on the water relations of two soil types; on the potassium, calcium, magnesium, and sulphur relations; as well as other information throwing light on the nutrition of plants under these controlled conditions.

LIMING EXPERIMENTS

Some outdoor cylinder work has been carried on for several years on the response of certain high mineral requiring crops to varying amounts of calcium and magnesium limestone. This work has been on a Volusia soil of high lime requirement.

Up to date the indications are that both forms of limestone in amounts far below the lime requirement of the soil will produce normal yields, especially of alfalfa. In some cases the small applications have given more satisfactory returns than the large ones.

NITROGEN CHANGES IN MANURE

This work has now been in progress for over two years and is conducted in cooperation with the Division of Soil Bacteriology. Some work with preserving agents has been done. In this phase of the work, acid phosphate has been found to be the most efficient agent among those tried which included also peat, straw, soil, gypsum, and rock phosphate, and a combination of these with straw as a litter. Acid phosphate not only held more of the nitrogen which is readily lost, but appeared also to conserve the organic matter in the manure. Such a manure gave the best results in vegetation experiments. Peat also had considerable value as a preservative.

Some work has been done in connection with the nitrogen changes in manure caused by pure and mixed cultures of certain manure organisms.

One of the most interesting phases of the problem is that of the detrimental effect of fresh straw on plants. This is not a new observation, but in the present work some interesting new phases have presented themselves. This phase of the matter is under observation at the present time.

DIVISION OF ANIMAL INDUSTRY

FEEDING EXPERIMENTS WITH POULTRY

Work has been continued on a series of feeding experiments relating to the importance of the coarser vegetable foods and the utilization of waste foods. Feeding trials this year have been limited to those with different amounts of clover or alfalfa for hens. These trials involved the incubation of different lots of eggs.

BREEDING EXPERIMENTS WITH POULTRY

In a study of the effects of selection and inbreeding, a series of breeding experiments has been continued. Besides the keeping of records from mature stock, this work necessitated during the year the rearing of progeny from eighteen separate matings.

STUDY OF SOIL REQUIREMENTS

This study is based chiefly upon the use of soil plats that have been modified by annual applications of chemicals and the growing of various crops to secure a gradual change without disturbance of natural conditions. Chiefly considered in this work have been the relations of plant to soil in regard to the amounts of sulphur and calcium. The crop grown this year was oats. This had been preceded by flax. Because these plats have been under continued observation for many years they will supply data such as perhaps cannot now be obtained elsewhere in regard to certain questions besides those primarily considered.

DIVISION OF BACTERIOLOGY

Members of this division have had problems under investigation during the year touching upon the activities of bacteria in relation to soil fertility and the rotting of manure, and the bacterial flora of dairy utensils, market milk, cheese, and food.

GENERAL PROBLEMS

Technic.— Methods of studying problems in this field are always of importance so that each year sees the development of new

methods of work or improvements on old methods. Thus because of the rapid changes in business introduced by the war an extensive cooperative investigation of biological stains has been organized. On account of the minute size of the bacteria, the bacteriologist has to make use of certain anilin dyes to render them visible when examined under the microscope. The dyes thus used are known as stains. One of the most important uses of stains made in this laboratory is in preparing microscopic mounts for counting the number of bacteria in milk. All the stains formerly came from Germany and, during the war, this laboratory found difficulty in getting satisfactory stains. Others were found to be having similar difficulty, and the matter was brought to the attention of the Committee on Bacteriological Technic of the Society of American Bacteriologists. Cooperative work has been organized, and this institution, together with about thirty other laboratories at various institutions in the country, has been making tests during the past year of the stains most frequently used in bacteriological work. Recently this work has been taken over by the National Research Council in order to put it on a broader basis and to secure the cooperation of all interested biologists. One of the men in this laboratory has been given the responsibility of organizing the work. Altho the work has only just begun the indications are that American manufacturers can supply biologists with the stains they need as soon as biologists are in a position to state their requirements definitely.

Three modifications of bacteriological methods have been found to have sufficiently promising applications to cause them to be described briefly in a technical bulletin (No. 84). One of these has to do with the use of agar slants as a means of detecting the ability of cultures of bacteria to ferment various substances. Another deals with the use of rose bengal as a bacterial stain, while the third discusses the application of the Gram stain to the differentiation of the various types of bacteria found in milk and cheese.

SOIL AND MANURE PROBLEMS

A general study of the soil flora.— This general investigation is one in regard to which information is slowly accumulating from year to year. All the soil bacteriological work in progress is so planned as to contribute to it. The first object was to outline the main groups of soil microorganisms, classifying them in a general way, without trying to recognize individual species; the second object to select the groups apparently most important, as judged by their relative abundance, especially under conditions of particular bacterial activity; and the third object to make a more intensive study of one or two of the groups, both

as to classification and as to physiological activities, including their function in soil.

For the present two groups have been selected for intensive study — the Actinomycetes, and a certain group of non-spore-forming bacteria. In regard to the first of these groups a technical bulletin (No. 83) has just been published entitled, "The Use of Various Culture Media in Characterizing Actinomycetes." It shows the great variation in the appearance of these organisms on different culture media and the difficulty of characterizing them by their appearance unless they are studied on a long series of media of definitely controlled composition. For the present no further work is being done on their classification, but a study is being made as to their significance in cellulose decomposition in the soil and in certain other related phenomena.

The second group of soil organisms mentioned above (the non-spore-forming group) has recently been given special attention because a certain member of it has been found to be an active liberator of ammonia in manure, far surpassing the well-known spore-formers in this respect. The whole group has proved a difficult one to study because with the usual routine bacteriological methods no differences between the different types could be found. New methods have had to be developed, and with them progress is being made toward the classification of this group.

Difficulty has been experienced in studying the activities of fungi and Actinomycetes in soil because their active forms are filaments that are difficult to separate from the soil particles. It has recently been found possible to distinguish these filaments when present in soil by the use of the microscope, and the method promises to be of considerable value in solving certain problems facing the soil bacteriologists.

The decomposition and preservation of manure.— This is a problem being investigated in cooperation with the Division of Agronomy. A preliminary bulletin on the subject is now in course of preparation. The first step in this investigation was to find an organism producing a vigorous volatilization of ammonia from manure which was at last located in one of the non-spore-formers above mentioned. The second step was to use this organism in testing certain preservatives or reputed preservatives (peat, acid phosphate, gypsum, and rock phosphate) as to their ability to hold ammonia in manure. Peat and acid phosphate proved efficient, the other two of slight use or none. The third step was to prepare composts containing manure, with and without straw, and with the different preservatives, and to compare those composts with fresh manure as to their ability to supply nitrogen to crops grown in the greenhouse. Barley and rape have been the test crops used. The work so far completed indicates the

superiority of acid phosphate over any of the other preservatives except peat, and has shown that it is probably more practical than peat except in localities where peat can be dug and dried without transportation any distance. Acid phosphate not only fixes the ammonia chemically, but acts as a partial antiseptic, greatly lessening the rotting of the manure.

Another line opened up by this work, which is now developing into a separate problem, concerns the effect of straw in a manure applied to the field. Fresh straw has a very harmful effect upon crops in the absence of a large amount of nitrogen. This effect may be purely chemical, or bacteriological, or both. Experiments on this point have been carried out which have brought out many interesting indications, altho nothing has yet been definitely established besides what has already been brought out by other investigators.

The effect of one plant on another.— This is a problem under investigation in cooperation with the Division of Horticulture. Certain work of Pickering in England has shown that trees and other plants are harmfully affected by the growth of grass near their roots. Pickering's work pointed to one of two explanations: That the effect is due to a toxin formed by the grass roots, or that there is an influence on the bacterial flora. He favored the former theory without disproving the latter. The present work is planned to test the bacterial theory. At the present time many interesting indications in support of this theory have been obtained, altho it has not yet been shown to be the explanation of the phenomena investigated.

DAIRY PROBLEMS

Market milk problems.— Investigations on methods of sterilizing milking machines have been continued during the year. These have been planned to test the efficiency of certain newly urged chemical sterilizing agents (the chloramines), the effectiveness and limitations of hypochlorite sterilizing solutions, and the effect of heat and cold in keeping down the bacterial contamination of the teat-cups and tubes. A report on this work is in preparation. A bulletin (No. 488) has also been issued during the year that discusses leakage from the vacuum pipe line into the pail as a source of contamination of milk. It is found that where there is condensed moisture in the pipe line, there is danger that a few drops of this material may, during or at the close of each milking, leak back thru most of the check valves now used on milker pulsators. While this contamination does not appear to be large in amount, it may easily be sufficient to prevent the production of milk with an official plate count less than 10,000 per cc.

The cause and amount of the error present in counting bacteria in milk by officially approved methods has been still further studied

during the year and a bulletin issued (Technical Bulletin No. 86). If milk is to be graded upon the number of organisms present and dairymen paid on this basis, in the interest of all concerned it is necessary that the methods of analysis used be such as to give just and fair results. Few persons, other than those who have attempted actually to count the number of bacteria in milk, realize how difficult it is to determine whether the methods of estimating numbers of these very small objects give results that are reasonably correct. If it were a matter of counting objects as large as sheep where it was desired to determine whether the estimates of the number present in a large flock were reasonably correct, it would be possible to check the estimated numbers against an actual count and to determine the error. But in counting bacteria the best that can be done is to compare the estimates of numbers as made in one way with estimates made in a different way. In this way the probable accuracy or lack of accuracy of results can be estimated. Because several promising improvements in these methods of estimating numbers of bacteria in milk have recently been suggested, a member of this laboratory has been asked to act as referee in a more extensive series of tests for the Standing Committee on Standard Methods of the American Public Health Association. While this is a technical matter it is of fundamental importance to the increasing number of dairymen in the State who sell their milk on the basis of the bacterial count.

This division has continued to supervise the milk supply during the year for the City of Geneva, the city authorities having continued to pay the salary of a bacteriologist to do the work. This work has supplied much material of value from the investigational standpoint. Two graduate students from the Department of Dairy Industry at Ithaca have utilized the facilities offered by this work to study the bacterial flora of market milk, and studies are being started at the present time upon the types of bacteria found in milk from farms where milking machines are in use.

Cheese problems.— Because of a feeling that further bacteriological investigations in the field of cheese making might show methods of controlling the manufacture of this valuable dairy product that would aid in restoring the vitality of this industry in New York State, studies in this field were resumed by this division in 1919. There seems to be no adequate reason for the importation of one-fifth of the cheese consumed in the United States in 1920. Neither does there seem to be any real reason why this State cannot produce sufficient milk to supply both the market milk and the cheese and other dairy industries of the State. Studies have been completed during the year upon the types of bacteria found in miscellaneous samples of cheddar cheese of all grades as purchased on the public market. Comparing the results

obtained from these samples with those secured by previous investigators at this and other laboratories, it appears that certain types of bacteria are more or less characteristic of poor quality cheese.

In these floral studies methods of preparing thin slices of cheese for examination under the microscope have been so modified as to make it possible to estimate the number of bacteria present, thereby allowing the investigator to form an idea of their relative abundance in the substance of the cheese. This work has been discussed in Technical Bulletin No. 87, under the heading, "The Microscopic Study of Bacteria in Cheese."

One group of bacteria, the micrococci, found commonly in cheese has been selected for further study in their relation to this group of bacteria as a whole, and a large number of cultures from a great variety of sources have been obtained and are being studied in their relation to similar bacteria isolated from cheese.

During the year the work referred to in the 1920 report has appeared as a bulletin (No. 486) under the title, "The Relation of the Number of Bacteria in Milk to the Quality and Yield of Cheese."

FOOD CONTROL PROBLEMS

Tomato products investigations.— In 1920, a request was made that this division undertake an investigation of the accuracy of the results secured in the microscopic examination of manufactured tomato products. In the present control work maintained in the enforcement of the national pure food law quantitative determinations are made of the mold hyphæ, yeasts, spores, and bacteria present in catsup, tomato pulp, and like products. The methods used in making these examinations are similar to the microscopic methods for counting bacteria in milk, and the counts obtained are open to the same question regarding their accuracy as are those obtained from milk. Funds having been supplied for the work thru the National Research Council, a special investigation of this matter has been made during the seasons of 1920 and 1921. While the report on the work is not yet ready, enough has been done to show that whereas the quantitative determinations of the larger objects like mold hyphæ, yeasts, and spores can be made with reasonable accuracy, it does not appear possible to make determinations of the number of bacteria present that are more than very rough estimates. The cause of the errors in counts have also been determined with greater definiteness than has been done previously.

DIVISION OF BIOCHEMISTRY

The work in the Biochemical Laboratory during the past year has been devoted to the two principal projects mentioned below:

ANALYSIS AND COMPOSITION OF CORN POLLEN

A study of the composition of corn pollen was begun, but the results so far are only of a preliminary character. It was proposed to secure some information regarding (1) the approximate composition, (2) the inorganic constituents of the ash, and (3) the nature of the principal organic compounds contained in the pollen grain.

The approximate composition of the pollen of three varieties of corn was determined. The results indicate that different varieties of corn produce pollen which varies greatly in composition. The greatest variation was found in the starch and sucrose content, but there was less variation in the percentage of nitrogen.

A complete analysis of the ash of pollen from one variety of corn was made. It was very rich in phosphorus and potassium, and of the other elements magnesium was quantitatively the most important. Silica, sulfur, chlorine, calcium, sodium, iron, and aluminum were present in smaller amount.

One amorphous and one crystalline phosphatide were isolated. Considerable amounts of free inositol, choline, and l-proline were also isolated from alcoholic extracts of pollen.

METABOLISM AND RESPIRATORY EXCHANGE OF POULTRY DURING
VITAMINE STARVATION

The greater part of the time during the past year was devoted to a study of the above-named problem. These studies included observations upon normal hens during the period of maximum egg production followed by a condition of vitamine starvation induced by feeding polished rice.

The first noticeable effect on the animals in vitamine starvation is a loss of appetite and the food consumption falls to a low level. There is a continuous loss in weight and the egg production ceases immediately. In from six to eight weeks active symptoms of polyneuritis appear, resulting finally in more or less complete paralysis.

When normal birds are first placed on a diet of polished rice a large amount of it is consumed daily. The metabolism is very high and the respiratory quotient approaches unity but it may vary from 0.95 to 1.35. After a few days on the rice diet the metabolism begins to fall and gradually reaches a very low level.

The fall in the intensity of the metabolism is coincident with the decrease in food consumption. It is due, however, to some factors outside of mere consumption of food because if the animal is fed forcibly the utilization of such food is much delayed and the crop and gizzard may contain undigested rice for over a week. In vitamine starvation the animal is therefore unable to utilize

in the normal manner a diet consisting of carbohydrate. During this condition the respiratory quotient may approach unity during the digestion of rice but the heat production as determined by the consumption of oxygen has fallen in some cases to 40 per cent below that of the normal basal metabolism.

With the outset of polyneuritis there is a practical cessation of the processes of digestion and assimilation. Altho the crop may contain much undigested rice, the respiratory quotient seldom rises much above the value for fat. The heat production may fall more than 50 per cent below that in normal basal metabolism.

The lack of vitamine "B" in the diet causes a serious impairment of the digestive functions which, unless relieved by the administration of this vitamine, results in polyneuritis and death. The condition, if it has not progressed too far, may be quickly relieved by giving an extract from yeast. After an animal has been cured of polyneuritis by the administration of yeast extract the metabolism rapidly rises again, but the animal gains very slowly in weight and the appetite remains poor for a long time.

DIVISION OF BOTANY

POTATO EXPERIMENTS

Further studies on the effect of missing hills in potato fields and on the variation in the yield of potato plants from halves of the same seed tuber.— This is the title of Bulletin No. 489 which gives a full account of experiments made in 1919 in continuation of the work reported in Bulletin No. 459. The results obtained confirm those previously reported in showing that, for a spacing of 36 by 15 inches, approximately one-half of the loss due to a single-hill skip is made up by an increase in the yield of the two plants adjoining the vacant space.

In an attempt to determine the relative influence of single-hill and triple-hill skips in increasing the yield of adjoining plants, the results obtained indicate that the difference is very small.

Plants from similar halves of the same seed tuber often differ widely in yield without apparent cause. This shows that some important factors in potato culture are either unknown or not estimated at their proper value. It shows, too, that great caution should be exercised in drawing conclusions from the comparative yields of a small number of potato plants; also, that the improvement of potatoes by hill selection cannot be carried to a high degree of perfection.

The "probable error," usually considered a reliable test of the statistical significance of mathematical results in which chance is a factor, has proved misleading in one instance in which it was used in this work.

Potato seed experiments: Whole small tubers vs. pieces of large tubers of the same plant.— The object sought in these experiments was to determine the relative vigor and productivity of plants from large and small tubers of the same plant. Rows planted with whole small tubers alternated with rows planted with pieces of the same average weight cut from large tubers of the same plant. Our first experiment of this kind was conducted in 1906. Owing to a peculiar combination of circumstances a favorable opportunity for repeating the experiment did not occur until the season of 1920. It was then repeated very successfully. The results are interesting, but it is unnecessary to discuss them here because a bulletin containing a full account of the experiments is now in press.

The "running out" of potatoes on Long Island.— Long Island potato growers have found it necessary to change their seed frequently because of the rapid deterioration of potatoes grown continuously in that region. Large quantities of northern-grown seed are used. The investigation of spindling-sprout disease made by the Station in 1914 (see Bulletin No. 399) showed the desirability of having a clearer understanding of the relation of that disease to the "running out" of potatoes. Accordingly, it was planned to conduct some experiments which were designed to throw light upon this subject. The plan adopted required the making of cooperative field experiments on Long Island and in northern potato growing sections, and since much of the seed used on Long Island is grown in Maine, the cooperation of the Maine Station was sought and obtained. It was expected that the investigation, which was begun in 1915, would require several years for its completion; but, at the beginning, it was not realized that leafroll and mosaic might seriously interfere with carrying out the experiments successfully. At that time, the infectious nature of leafroll and mosaic were unknown. These two diseases have affected the experiments injuriously. While the objects sought have been only partially attained, it is now thought advisable to close the investigation and publish the results in a bulletin to be issued in the near future.

Control of leafroll and mosaic in the potato seed plat.— During the past two seasons a potato seed plat has been maintained on the Station farm for two purposes: (1) To secure healthy seed for use in potato experiments conducted by the Station, and (2) to determine whether leafroll and mosaic can be controlled by isolating the seed plat and reguug it thoroly.

In connection with this work an attempt has been made to secure small quantities of seed potatoes free from mosaic and leafroll by using the tuber-index method devised by Dr. F. M. Blodgett of the New York State College of Agriculture. Some important

results have been obtained, but they cannot be announced until further studies have been made.

The spread of potato leafroll to adjoining healthy plants.—An excellent opportunity having been presented for securing desired information on this subject, a field experiment was conducted on the Station grounds in the season of 1921. The results will be announced as soon as they can be prepared for publication.

Dusting vs. spraying of potatoes.—The Botanical Division is co-operating with the Entomological Division in conducting experiments which are designed to show the relative efficiency of dust and liquid sprays in the control of diseases and insects which attack potato foliage.

WINTER INJURY OF APPLE TREES

Six years ago a small orchard of Ben Davis apple trees was planted on the Station grounds for use in experiments designed to determine the conditions which induce winter injury. Among other things the effect of heavy applications of stable manure is being tested. While interesting results may be expected at any time now, it is likely to be several years before this study will be completed.

BLISTER CANKER OF APPLE

An investigation of apple canker carried on for several years past has been completed and the results published in Bulletin No. 485. The original object of this investigation was to determine whether the fungus *Nummularia discreta*, which is associated with the disease, is really the cause of it or merely a saprophyte. It was proved conclusively that the fungus is parasitic and the cause of the disease. Many other things were learned about the disease, including means by which its ravages may be lessened materially, but no thoroly satisfactory method of control was discovered. A coat of shellac followed by coal tar was found to be the most satisfactory dressing for pruning wounds.

BEAN STUDIES

An attempt is being made to determine the relation of the time of planting beans to the severity of attack by bacterial blight; also, to produce, by crossing, strains of beans resistant to bacterial blight. Another trouble under investigation is the hardness of beans. This is of two distinct types — hardening of the interior, to which the name sclerema is given, and hardening of the seed coat which we may call hardshell. The former results from enzymatic changes produced by storing the seed in a damp atmosphere and at a high temperature in the absence of ventilation. The latter is a physical condition produced by storing seed in an artificially heated room with a relatively low humidity. Beans ripened

in hot, dry weather also acquire this condition in the field. Both kinds of hardness injure the beans for planting and for cooking purposes. This investigation is incomplete, but a preliminary report on it has been published on page 60 of the Proceedings of the Twelfth and Thirteenth Annual Meetings of the Association of Official Seed Analysts of North America.

ASTER DISEASES

A destructive new leaf blight and some other diseases of China asters are being studied. The fungus causing leaf blight, being new to science, has been given the name *Septoria callistephi* Gloyer.¹ Experiments on the control of leaf blight by spraying and seed treatment are in progress.

SEED TESTING AND SEED STUDIES

During the year ended June 30, 1921, the seed analyst and his assistant tested 1,874 samples of seed. Of these, 1,469 samples were tested at the request of farmers and seed dealers, 392 for the State Department of Agriculture in connection with the enforcement of the seed law, and 13 for the Association of Official Seed Analysts in connection with referee work. Some of the samples were tested for purity, some for germination, and some for both purity and germination, the total number of tests made being 2,387.

A rather extensive study has been made, also, of the quality of lawn grass seed mixtures sold in the State. A bulletin on this subject is in preparation.

Much of this seed testing is routine work, but some research is carried on in connection with it. As time would permit, further study has been made of the parasitic fungi carried on seeds, of the methods of testing vegetable seeds, and of the comparative behavior of the "hard seeds" of legumes in the germination chamber and in the field.

During the past year the seed analyst has served as chairman of the Committee on Research and Methods of the Association of Official Seed Analysts of North America and, as such, has had general direction of certain research activities of the Association. Co-operative studies have been made on "hard seeds" of legumes, on detecting the origin of seed, on the number of seeds per unit weight, and on methods of seed testing in general. Our seed analyst has also had the task of preparing the Association's referee samples, consisting of 40 sets of 11 samples each, and, later, of tabulating the results of tests made on them by analysts in various laboratories thruout the United States and Canada.

In the seed work an attempt has been made to cooperate with all agencies whose aim it is to bring about the use of better grades

¹ *Phytopathology* 11, 50. 1921.

of seed in New York State. It is believed that the seed laboratory renders a valuable public service.

DIVISION OF CHEMISTRY

PROPERTIES OF CASEIN

As casein is the constituent of milk which makes possible the manufacture of cheese, performing certain fundamental, important functions, both mechanical and chemical, it is necessary to learn all that is possible about the properties of casein before we can hope to understand fully its detailed relations to cheese-making and cheese-ripening. Our attention has thus far been directed to a study of the compounds formed by casein under those conditions prevailing in the manufacture and ripening of cheese. The work thus far has resulted in establishing some important fundamental facts but is still incomplete. It is expected that the work will be sufficiently advanced to justify the publication of results in the near future.

INSPECTION OF COMMERCIAL FERTILIZERS, 1921

The total number of samples of commercial fertilizers analyzed was 738, the largest since 1915. The number of samples in each class was as follows: 382 samples of complete fertilizers; 118 samples containing nitrogen and phosphoric acid; 54 samples containing phosphoric acid and potash; 68 samples of acid phosphate; 25 samples of nitrate of soda; 34 samples of bone; 11 samples of tankage; 3 samples of potash salts; 26 samples of dried animal manures; 13 samples of lime compounds; and 4 samples of miscellaneous materials.

INSPECTION OF FEEDING STUFFS, 1920

The total number of samples of feeding stuffs analyzed was 871, distributed as follows: 13 samples of alfalfa meals; 53 samples of animal products; 7 samples of buckwheat by-products; 21 samples of calf meal and pig meal; 5 samples of cocoanut meals; 201 samples of compounded feeds; 107 samples of compounded feeds containing molasses; 24 samples of corn gluten feeds and meals; 17 samples of corn meal and corn feed meal; 5 samples of corn, oats, and oat by-products; 42 samples of cottonseed feeds and meals; 5 samples of dried beet pulp; 30 samples of hominy feeds and meals; 24 samples of linseed meals; 20 samples of miscellaneous materials; 5 samples of oats and oat by-products; 114 samples of poultry feeds; 7 samples of rye products; 8 samples of wheat and rye products; 50 samples of wheat bran; 27 samples of wheat bran and middlings; 2 samples of wheat bran and low grade wheat flour; 9 samples of wheat bran, wheat middlings, and low grade flour; 64 samples of wheat middlings; and 9 samples

of wheat middlings and low-grade flour. The results of the analyses are discussed in Bulletin No. 482.

DIVISION OF DAIRYING

TESTING GLASSWARE

The total number of Babcock test bottles examined and marked under the law requiring such glassware to be tested was 39,977 from December 1, 1920, to December 1, 1921. The amount of each type of glassware with the total number of rejections is given below.

BABCOCK GLASSWARE TESTED FROM DECEMBER 1, 1920, TO DECEMBER 1, 1921

Milk bottles			
8 per cent.	14,168		
10 per cent.	9,671		
6 per cent.	6		
			23,845
Cream bottles			
9-gram, 6-inch, 60 per cent.	72		
9-gram, 6-inch, 50 per cent.	3,493		
9-gram, 6-inch, 40 per cent.	120		
9-gram, 6-inch, 30 per cent.	305		
9-gram, 9-inch, 50 per cent.	1,018		
9-gram, 9-inch, 30 per cent.	74		
18-gram, 6-inch, 60 per cent.	72		
18-gram, 6-inch, 50 per cent.	1,220		
18-gram, 6-inch, 40 per cent.	270		
18-gram, 6-inch, 30 per cent.	631		
18-gram, 9-inch, 55 per cent.	276		
18-gram, 9-inch, 50 per cent.	482		
18-gram, 9-inch, 40 per cent.	168		
18-gram, 9-inch, 30 per cent.	803		
			9,004
Pipettes			
17.6 cc.	4,630		
18 cc.	261		
9 cc.	584		
8.8 cc.	60		
17.6 and 18 cc. combined.	97		
Up-to-date 17.6 cc.	104		
Russian 17.6 cc.	21		
Miscellaneous	95		
			5,852
Skim milk bottles		383	
Acid measures		575	
			39,659
Rejected glassware			318
Total			39,977

The above table shows that a large variety of Babcock test bottles are in use in the State and suggests the advisability of limiting the types to those that are most desirable.

COOPERATION WITH OTHER DIVISIONS

The Dairy Division has continued its former policy of using the dairy herd for the needs of other divisions. The Division of Bacteriology has continued its study of the production of clean milk with the milking machine and has used some of the milk for the manufacture of cheese to be used for experimental bacteriological work. The Chemical Division has prepared pure casein from the milk for experimental work with casein.

DIVISION OF ENTOMOLOGY

CONTROL OF PEAR THRIPS

This insect is one of the most destructive pear pests in New York, but has been injurious mainly in the Hudson River Valley. The pest presents a difficult problem because of the nature and suddenness of its attacks. The period for effective treatment is restricted to a very brief interval when the buds are breaking and until they are opened at the tips. The physical features of the locations of the orchards, such as the direction and elevation of the slopes of land, proximity to the Hudson River, and character of the soil, have a marked influence on the development of the buds. The time for effective spraying, therefore, often varies with different plantings. Because of the difficulties encountered, many orchardists are taken unawares and fail to secure the degree of control proportionate to their expenditures for labor and materials.

In Bulletin No. 484 attention is directed to a number of experiments which have demonstrated that the pear thrips can be effectively controlled by spraying. The critical period for successful treatment begins with the emergence of the adults and continues until the buds open.

Several applications may be advantageously employed; *viz.*, one or two when the adults first appear, a third when the blossoms are in the cluster-bud stage, and a fourth against the larvæ when the petals are falling. Miscible oil or whale-oil soap in combination with nicotine sulfate have given the best results in recent years when applied with a spray outfit capable of maintaining a pressure of from 200 to 300 pounds.

CONTROL OF APPLE APHIDS WITH DELAYED DORMANT SPRAY

Bulletin No. 487 describes experiments and observations made in continuation of previous work of this Station on the life history and habits of rosy and green apple aphids, and on the improvement of control measures. The data corroborate the results of earlier experiments showing that the rosy aphid can be effectively controlled by a thoro application of the delayed dormant spray

made when the leaves have protruded from one-fourth to one-half inch.

In substantiation of previous efforts, the green aphid was only partially controlled by the delayed dormant spray, as the winged migrants reinfested the trees during the summer, altho this mid-summer infestation was not generally sufficient to cause appreciable staining of the fruit.

The mixture which has proved most efficient, safe, and economical is composed of $2\frac{1}{2}$ gallons of lime-sulfur, $\frac{3}{4}$ pint nicotine sulfate, and water to make 100 gallons. If 11 gallons of lime-sulfur are used per 100 gallons of the mixture, the spray will also control San Jose scale, while both mixtures assist in checking apple scab.

Besides selecting a spray mixture that is toxic to the insect, it is noted that other important factors to be considered in the control of aphids are thoro pruning, proper time of application of the spray, and thoro spraying.

Thoroness of application can be accomplished by the nozzlemen operating from the ground and spraying each tree systematically, using a properly adjusted spray-gun attached to a 50-foot lead of hose which delivers the liquid under a pressure of not less than 200 pounds. Detailed directions are given for the system of spraying followed by the Station in its experimental work. The object of this system is to direct the spray toward each bud from several angles and at the same time to keep the operator and team as free as possible from the spraying mixture.

CONTROL OF APPLE RED BUGS BY DUSTING

Bulletin No. 490 deals with experiments with spraying mixtures and certain insecticidal materials in powdered form which had as their object the determination of the value of dusting in protecting apple orchards from injuries by red bugs. This study represents one of a number of projects under investigation by this Station which seek to obtain information relative to the susceptibility of common sucking insects such as aphids, scales, capsids, etc., to powdered substances; the influence of the chemical and physical properties of the materials used on the effectiveness of the substances as insecticides; and the effects of temperature and moisture on the toxicity of dusting mixtures. On account of their size, habits, and availability, red bugs lend themselves readily to an investigation of this sort, and this investigation was the first of the various projects under way to yield definite data.

In the experiments described, dusting and spraying mixtures containing nicotine sulfate were toxic to the apple red bugs, the nymphs and adults of both species proving very sensitive to treatment. Dusting mixtures containing 0.25, 0.50, 1.00, and 2.00 per cent nicotine displayed marked insecticidal properties.

In the treatment of 20-year-old trees, the dusting mixture applied at the rate of 5 pounds per tree was more effective than a 2-pound dosage per tree. As demonstrated with spraying mixtures, the results showed very conclusively that the amount of protection secured by the treatment depends to a large extent on the degree of thoroughness of application.

Ordinary temperatures for the season, freedom of foliage from moisture, or wetting of leaves by dews or showers apparently exerted no appreciable influence on the effectiveness of dusting materials.

Effective dusting mixtures against red bugs require a larger nicotine content than spraying mixtures and, while there is great economy in time and labor by this method, the high dosage makes the expense of treatment per tree noticeably higher than that of spraying.

In view of the data available, it is concluded that apple red bugs may be effectively controlled by dusting, and concise directions are given to guide orchardists who desire to combat the insects by the new system of treatment. It is noted that dusting of apple orchards for sucking insects is in its first stage. Future efforts will doubtless reveal the desirability of modifications in present field practices as well as in the selection and compounding of materials.

STUDIES ON PEACH INSECTS

The chief object of this project is to ascertain the safeness and effectiveness of para-dichlorobenzene for the control of the peach borer. The deforming of young peach fruits by capsids as an investigational problem came to our attention during 1917 in connection with preliminary studies with the peach borer. Our studies have revealed the interesting fact that at least three species of plant bugs, breeding on hickory and oak, are the causal agents of serious deformities of peach fruits.

STUDIES ON CABBAGE INSECTS

In experiments with the cabbage maggot efforts are largely directed to the control of the pest by corrosive sublimate. The chemical is apparently destructive to the eggs and young larvæ of the species and, at standard dilutions, has proved quite safe to plants with a well established root system. The cabbage aphid and the imported cabbage worm are receiving attention with respect to their susceptibility to dusting mixtures.

STUDIES ON PEAR INSECTS

Life cycles of various species with reference to the period of occurrence of damage are under observation and characteristic injuries to fruits are being described and illustrated. Special attention is also being given to the psylla, thrips, and the sinuate

borer to develop economical and effective means of control. The investigation of the sinuate borer is practically concluded and the results of the investigation are being prepared for publication.

STUDIES ON POTATO INSECTS

In cooperation with the Division of Botany, these efforts seek primarily to determine the susceptibility of such species as leafhopper and aphid to dusting mixtures.

STUDIES ON GRAPE INSECTS

The object sought in these studies is to determine the comparative merits of dusting and spraying in controlling the grape root-worm and leafhopper. One experiment with para-dichlorobenzene is under way to ascertain its effect on grape vines and its usefulness against the grape root-worm.

STUDIES ON SAN JOSE SCALE

This investigation has been under way for several years. The number of broods proves to be smaller than determined for the latitude of Washington, D. C. There is a high rate of mortality among larvæ produced after the middle of September. The superiority of sulfur sprays for this area is due, in part, to a prolonged insecticidal action as compared with other materials.

SPIDER MITES ON FRUIT TREES

Injuries by mites are important, especially on bush and tree fruits in the Hudson River Valley. In this study effort is being made to determine species, distribution, and methods of control.

DIVISION OF HORTICULTURE

TESTS OF FRUIT VARIETIES

The Horticultural Division is continuing the work of testing all varieties of tree, bush, vine, and runner fruits that will grow in this climate. These tests have been carried on for more than 30 years, during which time about 10,000 varieties of fruit have been grown on the Station grounds. An attempt is made to test every variety of fruit offered by American nurserymen. Many varieties are imported from foreign countries. The results have been set forth in the fruit books published by the Station. Books on apples, grapes, plums, cherries, and peaches have been published. A volume on the pear is now in the press, and work for a monograph on small fruits is under way. Results have also been published in the series of bulletins called New and Noteworthy Fruits, five of which have appeared. Reports have also been made from year to year at various horticultural meetings.

BREEDING EXPERIMENTS

Under the assumption that there can be no great progress in horticulture without new varieties, the Horticultural Division is attempting to originate varieties of all the fruits that will grow in this climate. While the chief object is to produce desirable varieties, that of ascertaining how the characters of different fruits are inherited is almost if not quite as important an object in these experiments. This work has been going on since the beginning of the Station, during which time approximately 30,000 seedlings of the various fruits have been grown. Up to date about 40 new varieties of different fruits have been produced, several of which have become standard sorts in the horticulture of the State and Country. These new varieties are introduced thru the New York State Fruit Testing Cooperative Association, Inc., Geneva, N. Y., and cannot be obtained from the Station. Besides the work with fruits, breeding experiments are being carried on in the greenhouse with cucumbers, muskmelons, and roses.

FERTILIZER EXPERIMENTS WITH FRUITS

In 1896 an experiment was begun in an orchard of Rome Beauty apples to test fertilizers for apple orchards. Previous to this time a test of fertilizers for orchards had been carried on for 12 years with negative results. With the feeling that the first experiment had not been well planned, the new experiment was much more comprehensive. Two reports of this experiment with Rome Beauty apples have been published showing that the results of applications of nitrogen, phosphorus, and potash were practically negative in the Station orchards. The last report was published in 1919. Results in 1920 and 1921 but emphasize the findings set forth in the two reports previously published. Fertilizer experiments with apples and pears are being carried on in four localities in the State in cooperation with the Agronomy Division.

Experiments are also being carried on with fertilizers for grapes in vineyards leased by the Station at Fredonia and Urbana. Work with grapes at Fredonia began in 1909. Two reports have been published on the results obtained at the Fredonia Station, the first appearing in 1914 and the second in 1919. No report has yet been made of the experiments in the Urbana vineyards. The tests, however, in both vineyards show that nitrogen, phosphorus, and potash have had a beneficial effect on wood growth, yield, and quality of fruit. Of the three elements, nitrogen has been most helpful. The experiments in both vineyards suggest that applications of nitrogen is all that is needed in most vineyards.

PRUNING EXPERIMENTS

Pruning experiments are being carried on by this Division with all tree-fruits and with the grape. Orchards of tree-fruits were set in the spring of 1912 to test various methods of pruning.

Unfortunately, two severe winters ruined the peach plantation so that the experiments with this fruit have been discarded. Blight and unfavorable environment destroyed so many of the quince plants in the experiment that this fruit is no longer under test. Unfavorable environment and the cold winters vitiated the tests with the cherries, and it is now doubtful whether the results of this fruit will be worth consideration. The pruning tests with the apple, pear, and plum, however, are satisfactory in all respects, and progress is being made in the experiments with these fruits. Three distinct phases of pruning are under study: Testing the value of little and much pruning; determining the effectiveness of summer pruning as compared with winter pruning; and ascertaining the merits of high- and low-headed trees.

At Fredonia and Urbana pruning experiments are under way with the grape. Bulletin No. 464, published in 1919, gives the results of the work with grapes at Fredonia where seven methods of pruning were under test. It was found from these tests that the various Kniffen systems were best. This work is being continued.

PROPAGATION EXPERIMENTS

Three experiments are being carried on to test methods of propagating apples. One is a comparison of budded and grafted trees, the especial objects of which are to find out whether budded or grafted trees come in bearing first, and which makes the better tree eventually. The second is an experiment in top-working apples. Several standard varieties of apples have been top-worked on young Northern Spy trees. The purpose of the experiment is to find out whether such sorts as Tompkins King and Twenty Ounce, whose trunks are very susceptible to a trouble known as collar-rot, will not make better trees on Northern Spy stocks. Incidentally, it is desired to learn from this experiment whether the season of ripening and the color, quality, and markings of fruits vary when the varieties are top-worked on Northern Spy stock. These experiments were begun in 1912. A report as to the value of the Northern Spy stock with the several varieties will soon be forthcoming. A third propagation experiment has for its purposes the study of variation and the heritability of variations in fruit trees. In this experiment buds have been taken from the most productive and from the least productive trees in a Rome Beauty orchard. The buds were worked on Northern Spy rooted cuttings set in the orchard in the spring of 1912. This experiment ought to throw light on the value of the so-called pedigreed apple trees.

A STUDY OF STRAINS OF BALDWIN APPLE

In the spring of 1911, 84 Baldwin apple trees were purchased from 40 different locations in the United States for the purpose of

ascertaining whether there are distinct strains of Baldwin, and if so, what the value of the several strains may be. These trees were set on a neighboring farm, and while they have not had the best of care, yet the experiment promises to serve eventually the purposes for which the test is being made.

STOCK EXPERIMENTS

Experiments with three tree-fruits are being carried on to determine the value of different stocks. Rather extensive experiments with the apple ran for ten years in three orchards in three different localities of the State, which showed that apples in commercial orchards are best grown in this State on standard rather than on any of the dwarfing stocks. In 1912, six stocks of plums were used for ten varieties of six trees each of the different plums most commonly grown in this State. The stocks used were St. Julien, Mariana, Myrobalan, peach, and *Prunus americana*. It now seems certain that the Myrobalan stock is the best for all varieties under test. The intention is to report on the experiment during the coming year.

A test of the value of Mazzard and Mahaleb stocks for sour cherries is also under way. The cherry plantation has suffered much from two cold winters and from unfavorable environment so that it may turn out that this experiment cannot be considered worth reporting, but there are many indications as to the behavior of the various varieties on the two stocks that will be valuable for certain varieties if not for all of those under test. In these stock experiments several criteria are used to judge the value of stock, as length of life of the trees, period and amount of fruiting, size and vigor of trees, and winter injury due to differences in time of maturity.

ASEXUAL INHERITANCE IN THE VIOLET

In 1914 an experiment was begun in the Station greenhouse to determine the effect of selection upon the length of blossom stem. Selections have been carried on each season in two directions — one for short stems and the other for long stems. Records are made of the blooms of each plant and at the end of the season cuttings are taken from the selected plants and propagated for the following crop. This experiment is expected to throw light on the heritable characters in other plants propagated vegetatively, as are all fruits. A report of this experiment was published in 1920 which shows that there are differences. Up until the time of publication, this experiment had only proved, however, that there existed differences which it seems may have existed before the experiment was begun. This experiment is to be continued indefinitely.

EFFECT OF ONE CROP UPON ANOTHER

This Division is cooperating with the Division of Bacteriology to determine the effect of one crop upon another. It has been dem-

